

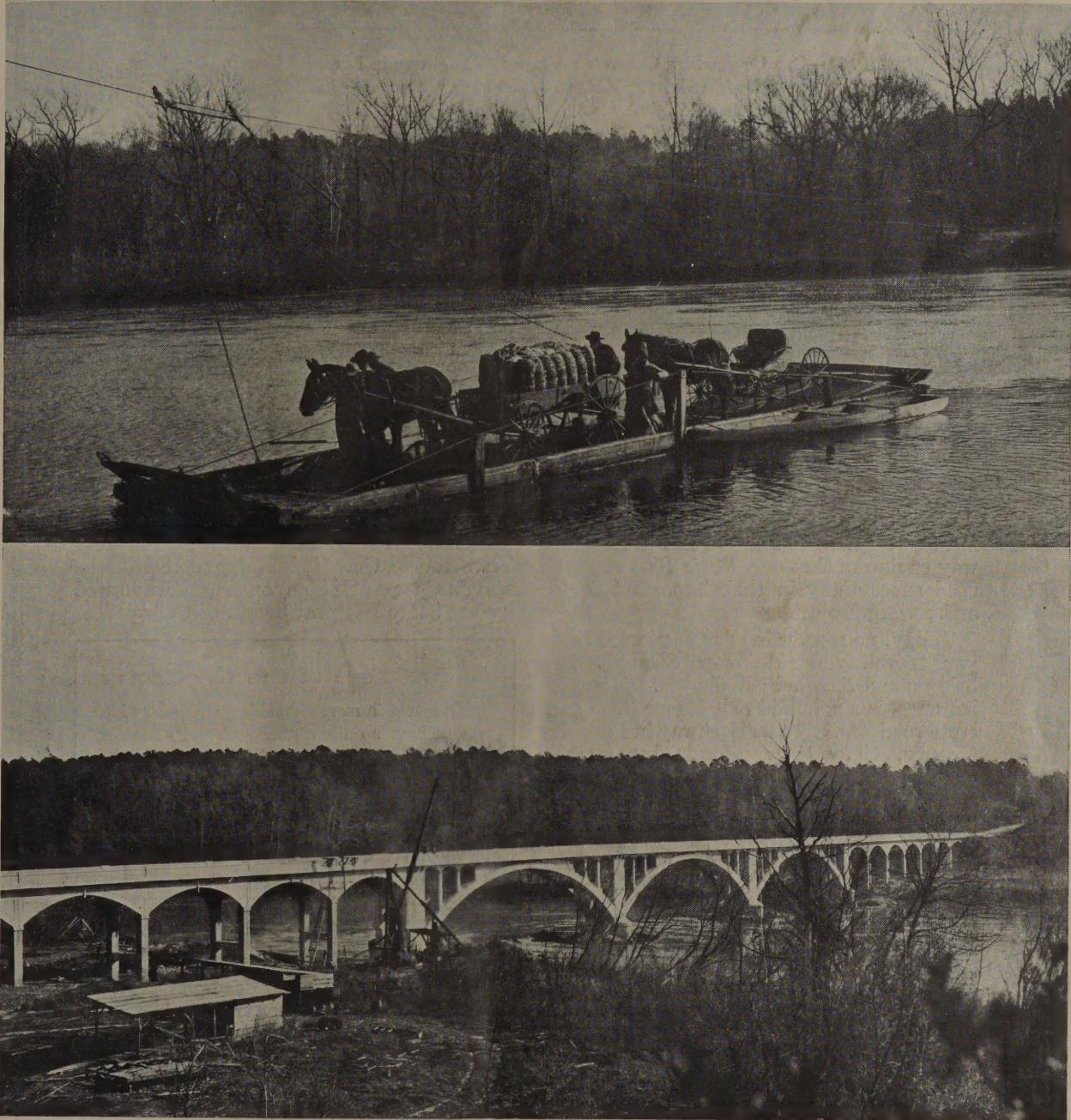
North Carolina

Highway Bulletin

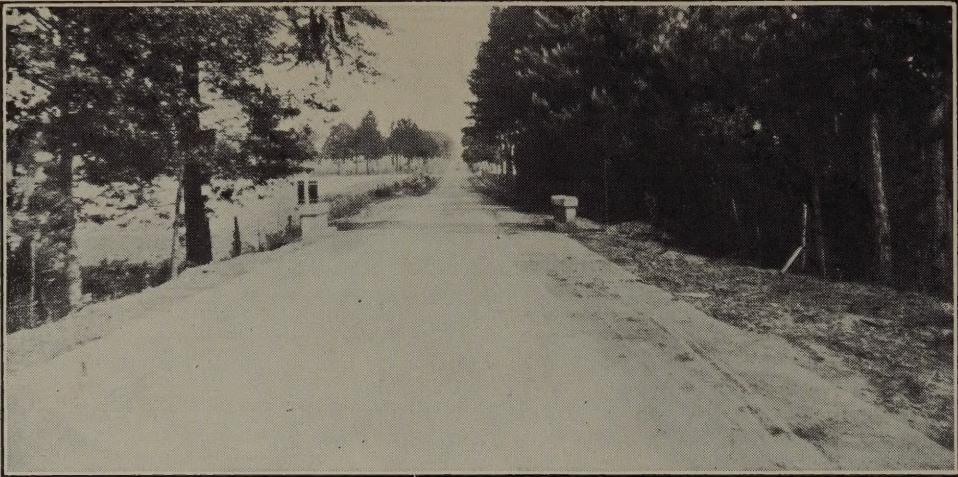
Vol. II

JANUARY, 1922

No. 11



Old & New—Above: Swift Island Ferry—Below: Swift Island Bridge—Project No. 116



F. A. P. 91—One Course Slag Concrete on National Highway in Lowndes County, Ga., just north of Valdosta. Width 16 ft., length 4.92 miles. Built by Nichols Contracting Co., (Atlanta).

All over Dixie you find good roads and bridges like these

**that owe their ability to resist the smashing
impact of truck traffic to**

**"ENSLEY" & "ALA CITY"
BASIC SLAG
CRUSHED & SCREENED**

Five or six years ago it was not an easy matter to persuade Federal and State highway engineers that our *Basic Slag* could be used successfully in their important bridge and paving projects.

Today, no matter in what section of Dixie you travel, you ride over *Slag* concrete bridges and *Slag* built highways. Here, for instance, is a splendid one course *Slag* concrete road on National Highway in Lowndes County, Ga. It was built by Nichols Contracting Co., (Atlanta), and is regarded as one of the finest roads of this type built under Federal Aid direction.

Lower photo shows 1128 ft. *Slag* concrete bridge spanning Ochlochnee River near Thomasville, Ga. This bridge represents the standard type of bridge construction adopted by the State Highway Dept. of Georgia.

Taking Care of the Contractor

Our two immense crushing and screening plants have a daily capacity of 6,000 tons of *Basic Slag*. Shipments at favorable "delivered" prices to all points in the Southeast.

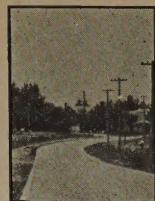


Birmingham Slag Co.

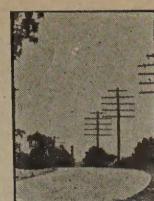
Slag Headquarters
for the South

Atlanta BIRMINGHAM Thomasville

F. A. No. 12—1128 ft. Slag Concrete bridge over Ochlochnee River near Thomasville, Ga. Built by Cornell-Young Co., of Macon, Ga.



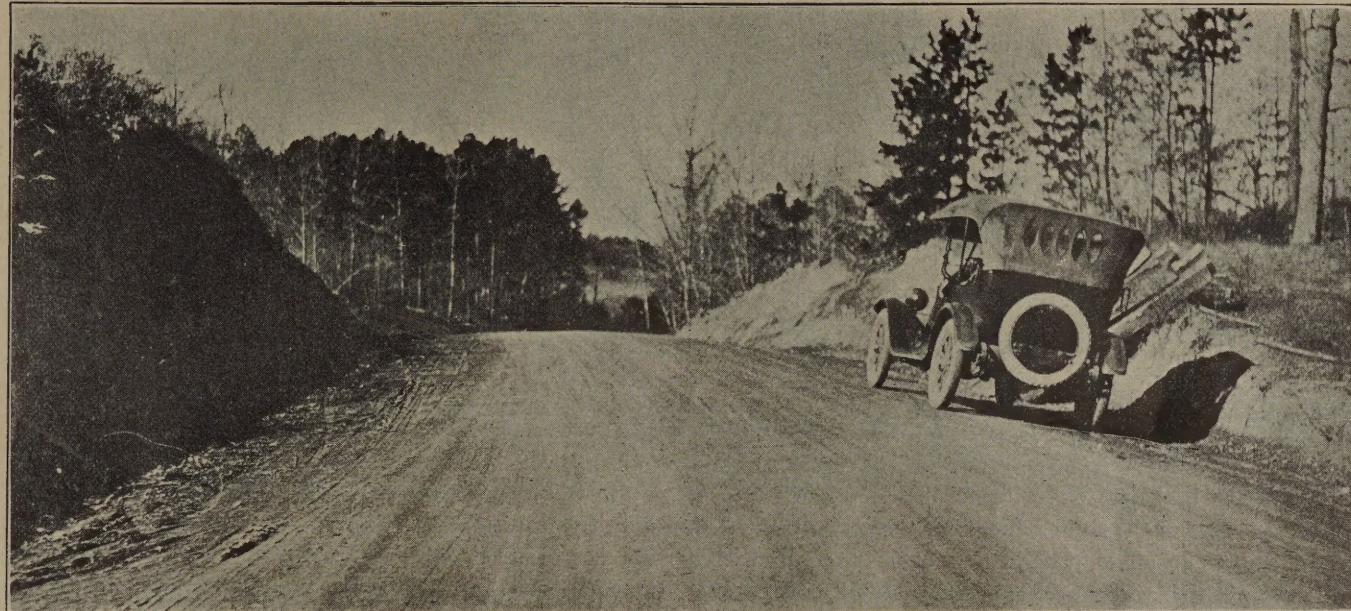
NORTH CAROLINA HIGHWAY BULLETIN



Vol. II, No. 11

H. K. WITHERSPOON, Editor

JANUARY, 1922



ROAD BETWEEN ALBEMARLE AND SWIFT ISLAND BRIDGE

Pee Dee River Bridge at Swift Island Completed

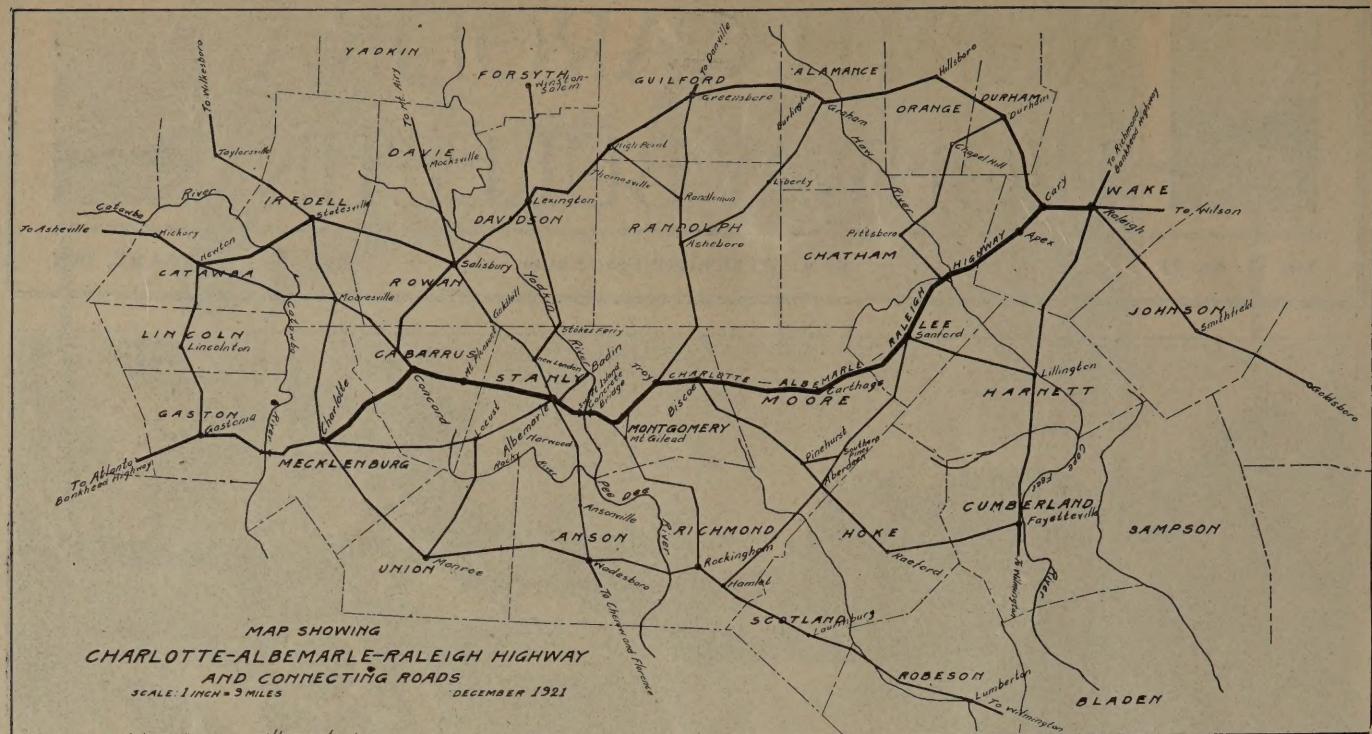
CONSTRUCTION was recently completed on the Swift Island Bridge, officially known as Federal Aid Project No. 116. Spanning the Pee Dee river just below the old "Swift Island" ferry, this magnificent structure of concrete and steel stands as a monument to the foresight and determination of certain progressive citizens of Stanly and Montgomery counties, to the skill of the engineers who designed it and of the contractors who built it.

Located approximately 8 miles east of Albemarle, the county seat of Stanly county, and 17 miles west of Troy, likewise the seat of Montgomery county, the bridge is situated between two of the richest counties in North Carolina, speaking of course from an economic standpoint, and its value as a factor in the development of this section of the State cannot be estimated as only the passing years can reap the rich results that are possible since an outlet has been provided for this long bottled-up territory. Besides its great value locally, the bridge opens a new and shorter route for traffic between the eastern and western portions of the State; it shortens the distance from Raleigh to Charlotte between 35 and 40 miles and provides a route, shortened equally as much, from Washington, Richmond, and other points North, to Atlanta. The

map which is shown on page 4 shows more clearly than can any words the directness of this new route via Sanford, Troy, and Albemarle. When that stretch of road through the lower corner of Cabarrus, a distance of from 7 to 10 miles, is improved, and this is to be done at an early date, the distance from Raleigh to Charlotte will be still further shortened making a total reduction of approximately 44 miles between the two points.

The roads, and certainly no bridge is of any value unless there be good roads on either end of it, along the new Raleigh-Albemarle-Charlotte Highway are excellent. True it is that there are very few miles of paved road between Raleigh and Charlotte but there is mile after mile of as good topsoil road as can be found anywhere, well graded and exceptionally well surfaced, giving the motorist all the opportunity that he desires to "step on 'er." (Editor's note: Stanly county has a very efficient speed cop.)

It is worth a trip to go to Stanly county and see some of her roads. Not a mile of paved road in the county but the finest gravel and topsoil highways that can be found anywhere in the State and there is a doubt in the Editor's mind as to whether or not their superior can be found in any other State. This county



T. O. Harris, Highway Engineer, Albemarle, N.C.

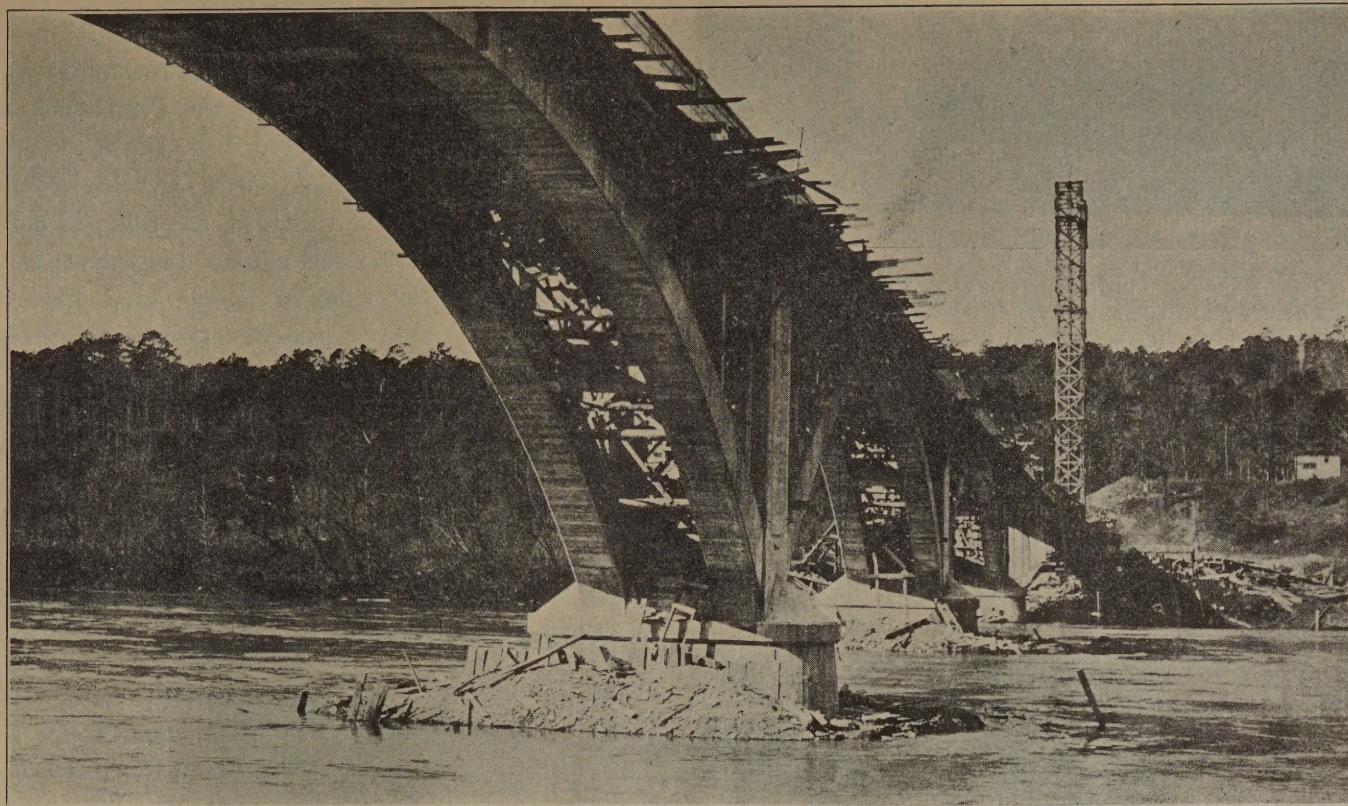
THE HEAVY LINE SHOWS THE DIRECT ROUTE BETWEEN RALEIGH AND CHARLOTTE

is fortunate in being a veritable storehouse of a most excellent road surfacing material—a peculiar kind of flinty gravel or shale, varying in color from dark red to brown, which when properly distributed and packed, affords a natural hard surfaced road. It is not "slick" like most of the artificial hard surface mixtures but rather resembles coarse emery paper. In excessively dry weather there is very little dust while only about an hour's sun is required to dry off the surface of one of these roads after a rain. And all of the roads in Stanly county are good roads. Realizing the need of a system of good roads and the immense benefits to be derived therefrom Stanly county went to work and built the most complete system of county roads to be found in the State. There are roads radiating from Albemarle in every direction, connecting with the county seats of the adjoining counties and forces are now at work building feeders to these main arteries—all of this work with one exception having been done without asking the State Highway Commission for financial assistance. In the construction of the highway from Albemarle to Swift Island bridge the State Highway Commission furnished one-fourth of the funds, one-fourth was allotted from Federal Aid funds, and the county paid the balance. Stanly has invested over \$500,000 in her system of roads but it is money well spent and she is forever lifted out of the mud.

To one of Stanly's citizens is due the credit for a large part of the work that has been done to bring this county to the front in highway work, and to this same man is due more credit than any other one man for the fulfillment of the dream of a bridge across the Pee Dee river at Swift Island ferry. For some years past Mr. John M. Boyette, of Albemarle, has

been working incessantly with this one idea in view and the counties of Stanly and Montgomery owe him an everlasting debt of gratitude for the handsome structure that now unites them. Coming to Raleigh for the purpose of seeking aid from the State Highway Commission, Mr. Boyette received very little encouragement and went back home somewhat discouraged but none the less undaunted. He had been told the conditions that were necessary to be fulfilled before the bridge could be built, seemingly impossible conditions at that time, but thanks to Mr. Boyette's energy and determination the conditions were met and the bridge built. Stanly and Montgomery united in furnishing the money that was necessary to meet the allotment from Federal Aid funds and the bridge was constructed without taking a penny from the funds of the State. "Boyette Bridge" would indeed be a fitting name for the bridge as an appreciation of the efforts of this citizen.

While the bridge was opened to traffic and the first car passed over on December 9th, the formal opening did not take place until December 28th at noon. Several thousand people from the nearby counties together with representatives of other parts of the State gathered at the bridge in honor of the event. A program had been arranged by a committee of representatives from the two counties and all of the speeches were heard with a great deal of interest by the audience. Since the structure is located on the dividing line between the Fifth and Sixth Construction Districts both District Commissioners made speeches presenting the bridge to the counties, Mr. J. Elwood Cox, of High Point, speaking for the Fifth District, and Mr. W. C. Wilkinson, of Charlotte, for the Sixth District. On



SHOWING THE CONSTRUCTION OF THE ARCHES

behalf of Stanly county the bridge was accepted by Mr. J. M. Boyette, while Mr. R. T. Poole, of Troy, did the honors for Montgomery. State Highway Commissioner Frank Page, representing the State made a most interesting talk, this being followed by a brief dedicatory address by Dr. Oscar Haywood, a noted Baptist divine and one of Montgomery's sons. Everywhere there was a spirit of rejoicing over the removal of the long existing barrier and of faith in the ultimate result of the opening of the new gateway.

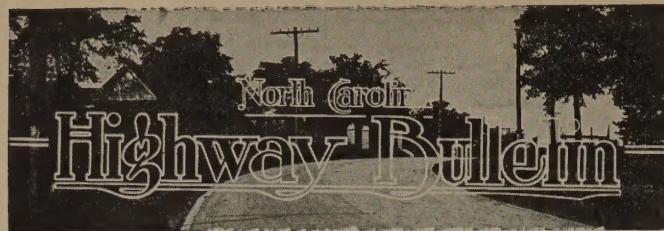
As constructed, the bridge is 1,090 feet 9 inches in length, with a clear roadway of eighteen feet, thus allowing ample room for two, and even three vehicles to pass. The bridge proper, or the portion over the river, consists of three reinforced concrete arches of the open spandrel ribbed type, each having a span of 146 feet 3 inches, while on either end of the structure there are seven 40 foot deck girder approach spans, also of reinforced concrete. By following the general arch scheme in the design of both the main and approach spans the impression of a series of arches throughout the entire bridge is gained. A considerable saving of material was effected by carrying the scheme of open spandrel walls and ribbed construction into the substructure as well as the superstructure, making the portion of the river piers between the ribs hollow, this method of construction detracting in no way from the stability of the bridge.

In round figures the bridge weighs 17,772,000 pounds and contains 244 carloads of material. Some of the items entering into the structure were 19,396 pieces

of steel, weighing approximately 371,480 pounds; 3,285 cubic yards of concrete made up of 20,000 bags, or 22 carloads of cement, 1,500 cubic yards, or 60 carloads of sand, and 3,000 cubic yards, or 100 carloads of stone; 342,600 square feet, or about 10 carloads of lumber, were used in building the forms; into this lumber there were driven 150 kegs of nails; the forms were braced and the reinforcement tied with 35 miles of wire. Plates and bolts weighing 9,000 pounds were used at various places in the bridge; 1,000 square feet of bituminous felt were placed in the expansion joints to provide for contraction and expansion; 32 cast iron scuppers were placed in the floor at intervals to provide for drainage; and 1,718 square yards of rock asphalt were placed on the roadway of the bridge as a wearing surface. On either end of the bridge bronze name plates bearing the name of the bridge, the number of the project, the names of the State Highway Commission, and that of the contractor were placed. Between 50 and 100 men were employed by the contractor on the work and equipment valued between \$40,000 and \$50,000 was used. During the course of construction 16 carloads of coal were consumed.

Plans for the Swift Island Bridge were prepared in their entirety in the Bridge Department of the State Highway Commission and the work was at all times under the supervision of engineers of the Commission. Bids were opened on this project in the office of the Division Engineer in Greensboro on August 25th,

(Continued on page 10)



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Address all communications in regard to BULLETIN to the Editor, Box 1140, Raleigh, N. C.

This BULLETIN will be sent gratis to any State or county official, contractor, newspaper, trade publication, library, or other person interested in the improvement of roads and in the work of the Commission. Advertising rates may be obtained on application.

Volume II

JANUARY, 1922

Number 11

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Editorials

Twenty-one Projects located in nineteen counties will be let to contract at the offices of the Commission in Raleigh on the 24th of February. Included in the projects to be let are four which consist of bridges only, while the remaining 17 are divided, according to mileage and type, as follows: 56.8 miles of the various hard surfaced types; 45.02 miles of topsoil, sand clay, or gravel; 12.71 miles of waterbound macadam; and 16.94 miles of graded road, making a total of 131.47 miles of roads and bridges. This mileage added to that of the letting to be held on February 7th makes a total of 218.82 miles of road let to contract in one month. The State Highway Commission has set as its goal for the year 1922 one thousand miles of road under contract and at the rate that it is going now there should be no trouble in accomplishing this aim.

Moving a Town is Obviously Impossible but the same result has been obtained by the completion of Federal Aid Project No. 116, or the Swift Island Bridge. Charlotte and Raleigh have been brought 35 miles closer together by the opening of the highway which this bridge has made possible.

Very few if any States have ever undertaken to clean off the snow from 6,000 miles of highways before it had even stopped falling yet this is what was not only undertaken but actually accomplished by the Maintenance forces of the State Highway Commission. Merely another example of the thorough organization of the forces caring for North Carolina's roads.

"Pee Dee" or "Yadkin". The use of the former name in the story of the completion of the Swift Island Bridge is not intended to convey the idea that the Editor has any knowledge of the correctness of either name. The good citizens of the neighborhood lying along the banks of the river, near the location of the bridge say that it should be "Pee Dee", the name changing at the point where the "Uwharrie" river joins the "Yadkin", and they should know; hence the use of this name.

A Review of Last Year's Work, to be found in this issue, shows that approximately three times as many miles of highways were completed during 1921 as had been completed during the time prior to that date since the appointment of a State Highway Commission. Unless well-laid plans miscarry the present year will be a banner one in the history of highway work in the State.

Highway Work in North Carolina, During 1921

GIVEN added impetus by the passage of the Doughton-Connor-Bowie Act highway construction in the State went forward by leaps and bounds during the past year and the beginning of 1922 finds North Carolina immensely better off along the line of good roads than she was a year ago.

The beginning of 1921 found the State Highway Commission operating with a comparatively small force, the Commission itself composed of only four members, and work drawing somewhat to a close as practically all of the available Federal Aid funds had been expended and very little new work was being let. Maintenance work was carried on entirely by the counties, where it was done at all, the Highway Commission merely standing part of the expense and acting in a supervisory capacity. The passage of the legislation mentioned above, however, wrought a wonderful change in the history of highway development in the State by completely revolutionizing the manner in which the work was being carried on. Besides being more than doubled in number, the Highway Commission was given far more power and greater control over highway developments in the State; suffi-

cient funds were provided for in the Act for the Commission to make plans for an extensive program of highway development such as had never before been undertaken by any Southern state and by very few of the Northern states. Immediately following the ratification of the new law and the appointment of the new State Highway Commission by the Governor plans were put under way for the immediate organization of a force large enough to carry out the program as outlined in the law. Surveys had to be made to determine just what roads would be taken over by the Commission and placed on the State Highway System, and the mileage of these roads obtained; this in itself was no small task. Building up of the present highway organization went forward smoothly until now the State of North Carolina has one of the best and most efficient departments that is to be found in any state in the Union. There is a spirit of loyalty and cooperation that runs throughout the whole force seldom found in an organization of like size and character.

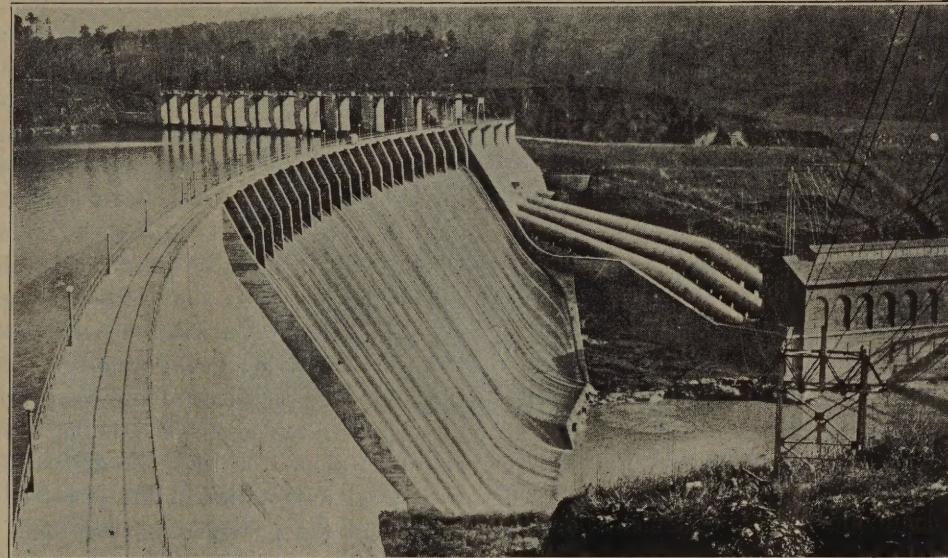
Highway construction and maintenance in the State under the provisions of the Doughton-Connor-Bowie Act did not get into full swing until after the first of July, the time between the passage of the law and this date being taken up in the organization of the present force, leaving only about six or seven months during the year in which any real progress was made along constructive lines. After work did get under way, however, it went forward with a vim, and the year which has just begun finds the Commission with a record year of work behind it. The Editor has compiled some statistics of the work done in 1921 that will tell the story of what has been accomplished better than can any words.

January 1, 1921 found under contract and construction 673.95 miles of road and bridges estimated to cost \$10,135,869.45, distributed as follows: 552.22 miles of the topsoil, sand clay, or gravel type, valued at

\$5,907,833.41; 15.55 miles of concrete pavement, costing \$553,404.63; of the bituminous concrete types, such as Topeka, Warrenite, etc., 61.71 miles, amounting to \$2,371,761.14; penetration macadam, 25.48 miles representing an expenditure of approximately \$631,545.06; waterbound macadam, 18.99

miles, costing \$420,912.41; bridge work, or projects consisting of bridges alone, amounting to \$250,412.80. Work had been completed on the above date as follows; roads of the topsoil, sandclay, or gravel type, 128.66 miles, at a cost of \$698,699.22; 16.07 miles of concrete roads, costing \$508,220.04; bituminous concrete roads costing \$386,671.54 for the 9.81 miles constructed; 6.01 miles of penetration macadam roads costing \$206,531.17; and 1 bridge which cost \$59,224.90, making a total of work completed of 160.55 miles at a cost of \$1,859,346.87.

In comparing the work placed under contract and construction during 1922 it should be borne in mind that very few contracts were awarded before July 1st, as the time before that date was almost entirely taken up with effecting a new organization. Work under construction or contract on January 1, 1922 amounts to 890.88 miles, representing a total expenditure of \$14,192,924.12. Of



THE BADIN DAM IS EIGHT MILES UPSTREAM FROM THE SWIFT ISLAND BRIDGE

Grade Crossings Must *be* Eliminated

THOUGH it is true that in a large number of instances the motorist and not the railroad is directly to blame for grade crossing accidents, the large number of fatalities that occur from this source each year emphasizes that fact that these "death traps" should be eliminated from the highways as soon as funds are available for the work.

There is an innate weakness in almost every motorist to "try to beat the train across" and in almost every instance he fails with the result that the undertaker has a job and the junk man some more scraps. Device after device has been invented and placed at crossings and, while some of these contrivances do add a measure of safety for pedestrians and motorists, nothing has ever been devised that is a sure preventive of grade crossing accidents. As stated at the beginning of this article, the motorist is largely to blame for the failure of crossing signals, gates, warning lights, etc. Investigation shows that in one case out of every three the automobile driver is either reckless or careless, which amounts to the same thing, at grade crossings, approaching them at a reckless rate of speed and without giving due attention to the possible approach of a train. Further, observations show that the average driver regards the familiar "STOP-LOOK-LISTEN" sign as being of less importance in his life than in his obituary and so only gives a casual glance to either side before crossing the track; others, presumably trusting in their patron saint, do not go to that trouble. The "speed demon," who feels that he must beat the train across, does not stand the chance of being killed as does his brother driver who is in no particular hurry and who ambles along about half-asleep, or perhaps engaged in conversation with his companion. This statement however should not be taken to mean that the fast driver is in no danger but because of the fact that he is driving fast, which in itself is dangerous, he is more apt to be on the alert. A fast train runs about 88 feet per second and there are very few people who are able to judge the speed of a locomotive with sufficient accuracy to take a chance on "beating it across the track." One of the best rules for avoiding trouble at a grade crossing is to come to a full stop. This necessitates shifting gears and in crossing the track with sufficient power to avoid stalling the engine and at the same time gives ample opportunity to take a good long look up and down the track before crossing. There is nobody in such a hurry that he cannot take the time to "stop, look, and listen" at a grade crossing and this

precaution is considerably cheaper in the long run than funeral expenses.

During the past year there were 12,000 persons killed on highways of the United States; 7,000, or nearly 60%, were killed grade crossing accidents. On these fatalities American insurance companies paid out \$4,500,000 in death claims; an amount sufficient to build, at current prices, approximately 130 miles of hard surfaced roads. In addition to the fatalities there were accidents which resulted in non-fatal injuries to 1,500,000 people. It is hard to conceive of a motorist deliberately running into a train and yet statistics show that this is what happened in 490 grade crossing accidents in 1921; in 122 cases auto drivers plunged through the crossing gates, while nine crossing flagmen were struck down by auto drivers while attempting to prevent them from driving in front of the train.

The Pennsylvania and Southern Pacific railroads have been particularly heavy sufferers from grade crossing accidents. On the latter road alone 1,909 motor cars and trucks were wrecked at grade crossings during the past three years. In 970 cases where motorists ran in front of trains, 136 persons were killed and 405 were injured; in 490 cases motor cars were stalled on the crossing and were demolished; and there were 43 instances in which the cars actually collided with the danger signals.

The figures given above were not gained from mere guess but were taken from accurate statistics, and with the constantly increasing numbers of motorists using the highways each succeeding year will show a greater number of accidents. The blame does not lie in the railroads alone for these grade crossing fatalities but with local authorities in the location of highways and largely in the persons who use them but, wherever it may lie, the alarming toll of human life that is taken each year in this manner makes it imperative that the matter of eliminating grade crossings be taken up without further delay for corrective study and action of some kind. There is no use in trying to make the grade crossing safe—there is no such thing—for, regardless of the safety contrivances, bells, watchmen, and the like, as long as there is a physical possibility of the motorist getting on the rails there is danger. An underpass or an overpass is the only solution of making the highways safe and with the large percent of casualties each year the subject should be taken in hand by every Highway Department in the country and by the various automobile associations with a view to reducing the exceedingly large number of grade crossing accidents.

STOP! LOOK!! LISTEN!!!

William L. Craven, Bridge Engineer

THE North Carolina State Highway Commission may well consider itself fortunate in having at the head of its Bridge Department a man who in highway circles is often spoken of as "the best concrete bridge designer in the United States." A road, no matter how good it may be or how much money was expended in its construction, is worthless as a facility for transportation unless its bridges are of the highest type and fully capable of carrying the loads which they are called upon to bear. The day of building bridges of anything but reinforced concrete is fast passing out and in a few more years only this type of construction will be seen on the highways of the country as it has proved to be the most economical and most satisfactory method that can be followed out. In order that a bridge of this type may develop its full strength with a minimum of materials it is necessary that its design be carefully thought out and put on paper before any construction is started. Therefore it is essential that the talent that does the designing be the best that can be found, and the State Highway Commission feels fully satisfied that it has secured this class of talent in the man who designs bridges that are built as a part of the State system.

William L. Craven, Bridge Engineer of the Highway Commission, whose likeness appears above, is a man of wide experience in his chosen line of work and is well qualified for the duties that he performs. Thousands of dollars have been saved the people of North Carolina by his expert knowledge of every phase of bridge construction and in the great highway program that is now under way there is opportunity for an even greater saving. It was in Mr. Craven's mind that the design for the Swift Island Bridge was formed and, under his direction, was later put on paper in the Drafting Room of the Bridge Department. Revision after revision was made with a view to improving the design and to eliminating any material that could be done away with without weakening the bridge in any way and at the same time without interfering with its aesthetic beauty. From his design and under his supervision has been constructed one of the handsomest bridges that graces a stream anywhere in the country, a bridge that stands as a monument to his skill and knowledge of concrete design. It is no small wonder that he is spoken of in terms mentioned at the beginning of this article.

Personally, Mr. Craven is one of the most pleasant men

that one often meets, yet he must be known to be appreciated. At all times modest and retiring, one would never learn from him of his skill in bridge work. He is a son of North Carolina, born in fact not very far from the location of his triumph in designing, in the town of Concord, Cabarrus county, more years ago than he is willing to admit. In his home town Mr. Craven attended private and public schools from 1885 until 1897 when he entered "A. & M." College, now State College, at Raleigh, for a course in civil engineering. After following this course for four years he was graduated in 1901 with the degree of "Bachelor of Science." Immediately after leaving college Mr. Craven accepted a position as a detailer of structural steel with the American Bridge Company, of Pittsburgh, Pa. He stayed there for a period of two years, leaving to become chief draftsman for the Carolina Steel Bridge and Construction Company, at Burlington, where, for about a year, he had charge of the design and detail work of all kinds of structural steel work. From this position he advanced a notch further in his chosen profession by accepting a position as Designing Engineer for the Virginia Bridge

& Iron Company at Roanoke, Va., in which capacity he had considerable experience in designing steel work of every kind. At the end of a year Mr. Craven accepted a position as Assistant Chief Engineer with the York Bridge Company, of York, Pa., where he was in responsible charge of preparing all designs and estimates. He continued in this capacity until 1915 when he resigned to enter private practice at Concord, during which time he designed and supervised the construction of several large steel bridges in the State. In 1917 he became connected with the State Highway Commission, then of small proportions compared with its present size, as Bridge Engineer and continues in the position at the present time. Mr. Craven has worked up in his department a very efficient organization of draftsmen and engineers, which is thoroughly capable of designing and building a bridge of any type or size.

Mr. Craven stands very highly in engineering circles throughout the country and is at present one of a committee appointed by the American Association of State Highway Officials at its recent convention held in Omaha engaged in standardizing the design of reinforced concrete bridges. He is a member of the American Association of Engineers and a director of the North Carolina Chapter of this organization.



WILLIAM L. CRAVEN

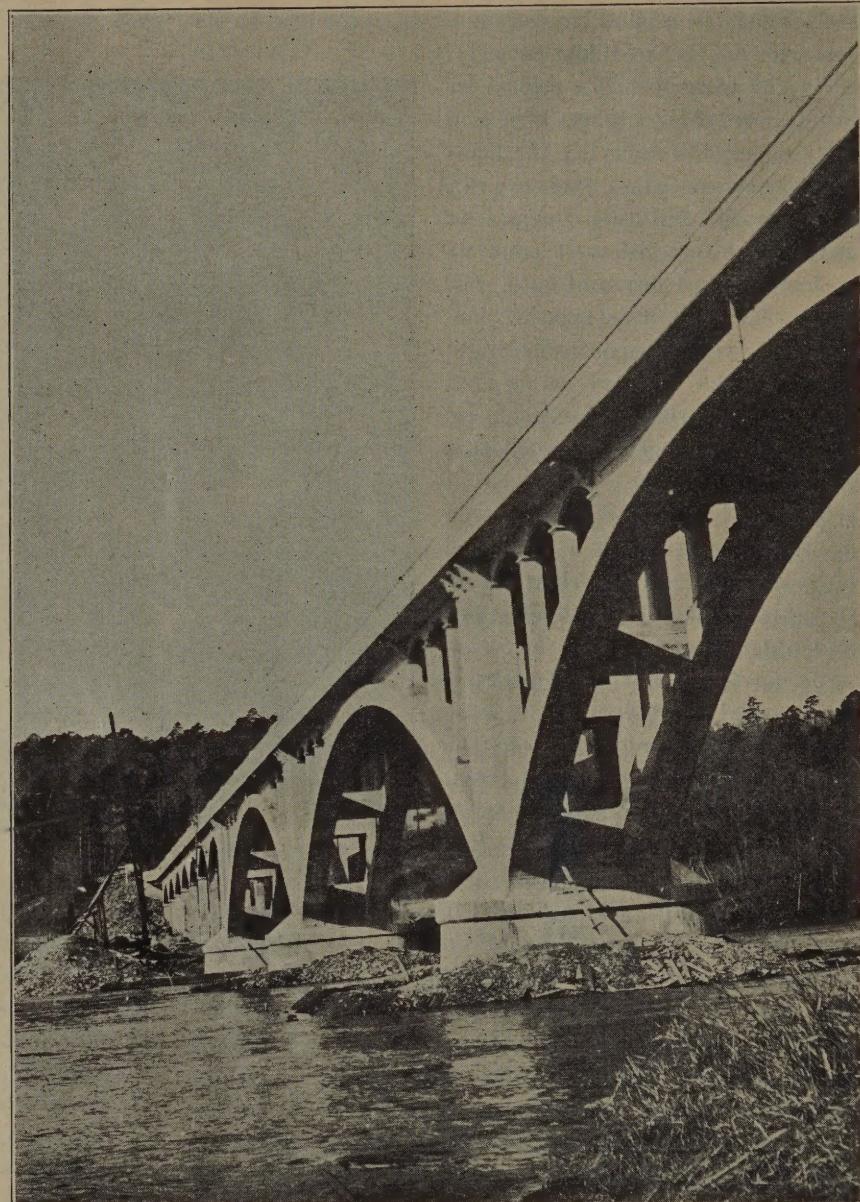
Pee Dee River Bridge at Swift Island Completed

(Continued from page 5)

1920 and the contract awarded to the Cornell-Young Company, of Macon, Ga. Excellent work has been done by the contractors and the bridge stands as an example of the class of work that this firm is capable of producing. A better constructed bridge, or a more beautiful piece of work, cannot be found anywhere. The work was begun under the supervision of Mr. C. S. Currier, as resident engineer, and to this man fell the task of getting the job under way; the manner in which he performed it reflects credit upon him. In the reorganization of the State Highway Commission, following the passage of the 1921 Highway Law, Mr. Currier was duly promoted to the position of District Engineer in the Seventh District, with headquarters at Elkin, and it became necessary to appoint another resident engineer for this work. For sometime before leaving the work Mr. Currier had as principal assistant, Mr. W. F. Morrison who, prior to going on this work, was in the Drafting Room of the Bridge Department of the Commission and had a part in the preparation of the plans for the structure. This gave him a very intimate knowledge of the details of the work and with this knowledge and by close attention to the job Mr. Morrison has turned out a piece of work that is practically perfect and in such a manner as to reflect a great deal of credit both upon himself and upon the organization of which he is a member. When the contract was let for the construction of this bridge the State was divided into four construction districts and this work came under the direction of Mr. John D. Waldrop, now Fifth District Engineer, and when the recent redivision took place it was decided that he should continue to handle the project. Approximately \$200,000 were expended in the construction of the work.

The completion of the Swift Island Bridge signalizes the fulfillment of a dream that has been in the minds of the people of that section and the surrounding coun-

try for years past. The work of the engineers and contractors is finished and a new era of development for Stanly and Montgomery counties is opening up, the result of which lies largely with the people making up these counties. There is no doubt but that within a



DOWNTREAM SIDE OF SWIFT ISLAND BRIDGE

try for years past. The work of the engineers and few years immense strides will have been made in opening up the storehouses that Nature has provided here and that this section will be enjoying the era of prosperity which follows the coming of adequate transportation facilities.

Maryland Makes Roads Well

The Maryland State Highway Department has recently adopted a system of direction and distance signs at road intersections which places it far ahead of many

states in the clear designation of roads for the benefit of travelers.

The signs are faced with metal and set on wooden

(Continued on page 12)

State Maintenance Forces Make Record *in* Removing Snow from State Highway System

THE telegram herewith which was sent to District Maintenance Engineers of the State Highway Commission set machinery in motion which accomplished a feat that is paramount in the history of road maintenance in the

United States. That the maintenance organization, which has been built up from the bottom during the last eight months, is efficient was proved by the fact that by nightfall Saturday most of the snow had been removed from the 6,000 miles of road making up the State Highway System. All of the three hundred maintenance gangs throughout the State are equipped with trucks, tractors, road machines, and drags, thus making the task of removing the snow no more difficult than dragging the road under ordinary conditions. When one stops to consider the fact that the whole organization went into action without the least hitch and accomplished the work of dragging practically the entire system in a day's time the task performed is little short of marvelous. The snow-fall which covered the entire State with a blanket varying from ten inches to two feet in depth left hundreds of thousands of tons of snow on the highways and had this been allowed to remain until it melted and ran off, or soaked in as it would have done in most cases, the highways of the State would have been damaged to an extent that would have required months to repair; the dirt roads would have been practically ruined as under the churning action of traffic they would have become a sea of mud. The operation that was carried on was a costly one but nothing like as costly as the work of repairing the

roads would have been had the snow been allowed to remain on them.

The maintenance gangs in the western section of the State, where a snow-fall is expected at any time, have

standing orders to take to the roads with the first fall of snow and to stay on the job until the roads are clear. The fact that the soils of the eastern section of the State are considerably lighter

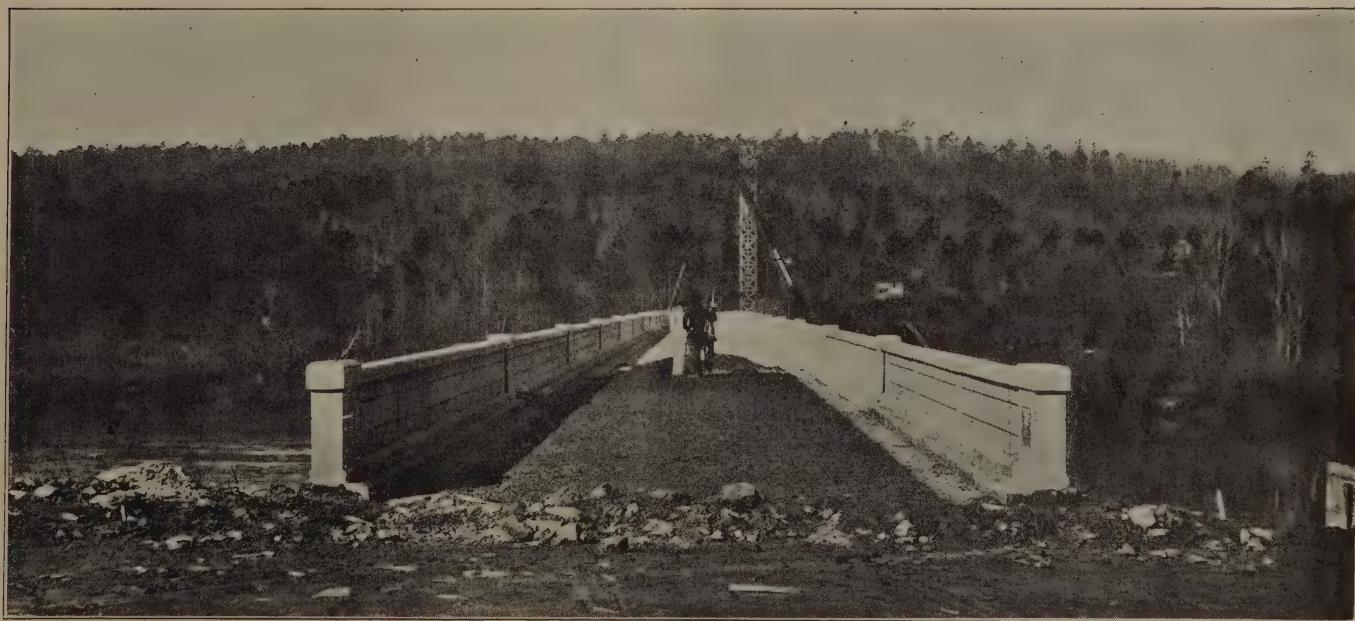
than those of the mountain sections, due to the larger proportion of sand, makes the snow proposition an infinitely more serious one than it otherwise would be, and renders it vastly more important to clear the highways of the western section as quickly as possible after the first fall of snow.

The State Highway Commission is proud of the work that this, one of the most important branches of its huge organization, has accomplished and a great deal of credit is due not only to the men who directed the work but to those who proved their loyalty by getting out on the roads regardless of conditions and performing the task set before them. It is typical of the spirit of loyalty and cooperation that exists throughout the entire organization.

The promptness with which the snow was removed from the entire State Highway System, six thousand miles in length, the distance across the continent and return, would have done credit to the cities and towns of the State and should be an object lesson to them, for it is safe to say that the State roads are in better condition today than many city and town streets.

THIS SNOW GIVES YOU AN OPPORTUNITY TO PROVE
EFFICIENCY OF YOUR MAINTENANCE ORGANIZATION.
CONDITION OF YOUR ROADS TWO WEEKS FROM NOW
WILL PROVE HOW GOOD YOU ARE. LET'S GO.

FRANK PAGE, STATE HIGHWAY COMMISSIONER



LOOKING TOWARD STANLEY COUNTY
(FORCE LAYING ROCK ASPHALT WEARING SURFACE)

Highway Work in North Carolina During 1921

(Continued from page 7)

this amount 606.64 miles, costing \$10,249,911.22, were awarded during 1921, the remainder being composed of Federal Aid projects, all of which were let prior to January 1, 1921. The former mentioned or total work awarded and partly placed under construction is classified as follows:

TYPE	MILEAGE	COST
Topsoil, Sand Clay, or Gravel	590.46	\$5,061,469.94
Reinforced Concrete	27.42	915,435.51
Plain Concrete	36.36	1,417,434.57
Topeka, Warrenite, etc.	147.79	4,705,581.34
Penetration Macadam	27.31	536,357.75
Waterbound Macadam	61.54	1,169,789.93
Bridgework	----	386,855.08
TOTAL	890.88	\$14,192,924.12

The work completed during 1921 only lacked a few miles of being triple the mileage that had been completed during the whole time that there had been a highway commission in North Carolina prior to January 1, 1921. The increased cost of the work completed during the past year over that finished previous to that time may be explained by the fact that most of that completed in 1921 was let during the period when both construction materials and labor were at peak prices, and an analysis of the table showing the work placed under contract and construction during 1921 will show a decided decrease in cost per mile over work let during the previous year. The following table gives in detail the mileage and cost of the various types of roadway in the projects completed during 1921:

TYPE	MILEAGE	COST
Topsoil, Sand Clay, or Gravel	381.26	\$3,952,665.57
Topeka, Warrenite, etc.	48.92	1,877,675.46
Plain Concrete	16.60	629,324.10
Penetration Macadam	14.65	449,298.64
Waterbound Macadam	4.99	153,899.13
Bridgework	----	250,412.80
TOTAL	466.42	\$7,313,275.70

The outlook for highway work in the State during 1922 is even brighter than it was last year. The Commission has made plans and is concentrating every effort on placing under contract before the end of the year 400 miles of hard surfaced roads estimated to cost, at present prices, approximately \$11,000,000, and 600 miles of gravel or topsoil roads which will cost in round figures \$5,000,000. Of this program approximately 250 miles of road have been advertised for letting during the month of February and it is expected that at least 700 miles will be ready to let, or will have been let, by June 1st. This program, which has been equalled by only one or two states and exceeded by none, will place North Carolina in the front ranks of states prominent in highway work. It is believed by those who are in position to speak with authority that as much work as is possible should be let within the next few months

as present prices are lower than they have been for sometime past, and it is believed that the extensive highway programs which are under way in other Southern states, provided pending legislation is carried



THE MEN WHO BUILT THE BRIDGE

Left to Right: W. F. Morrison, Resident Engineer in charge of construction; John D. Waldrop, Fifth District Engineer; W. A. Young, of Cornell-Young Co., Contractors.

through, will have a decided effect on the present low prices and will have a tendency to advance the cost of materials through an increased demand. With this in view the Commission has built its engineering organization up to a point where it is believed that the prospective program can be carried out successfully.

Maryland Makes Roads Well

(Continued from page 10)

posts into concrete bases. They show the name of the highway in white letters on a black background; the distance to and from important points and all principal connections. In addition, 10x10 ft. maps are being erected at the limits of each town. They show the main routes through the town in white and the secondary routes through the town in white and the secondary landmarks are all marked so that the traveler can choose his itinerary according to the points of interest. They are oriented to read in the direction of travel, so that if the signboard were laid on the ground the routes follow the proper directions. On each map is a red star with the words "You are now at this point."

At the top of mountain grades similar signboards are being erected to tell the motorists the number of miles down the mountain, warn him of curves and give him concise instructions about how to drive in order to avoid accident. At all entrances to the State signs carrying the salient points of the Maryland vehicle laws are going to inform the visitor about speed limits and traffic rules. The entire signboard system is under contract for repair and renewal each year.—*Good Roads.*

STATUS OF FEDERAL AID WORK IN NORTH CAROLINA

Projects Under Construction

"H S" denotes any type of hard surfaced road.

"G" denotes any type of gravel, sand-clay, or topsoil road.

NO.	COUNTY	LENGTH	TYPE	APPROXIMATECOST	BEGUN	CONTRACTOR
4	Craven.....	9.46	G	\$ 21,089.23	10-12-19	County Commissioners
13	Wayne.....	12.573	G	101,467.23	5-25-20	County Commissioners
15	Guilford.....	4.205	H S	5,441.75	9- 1-17	County Commissioners
16	Haywood.....	14.27	G	64,705.05	7-26-19	County Commissioners
17	Wilkes.....	17.6	G	101,386.08	10-15-18	County Commissioners
49	Lenoir.....	6.017	H S	199,872.19	2- 9-20	T. H. Gill & Company—West Construction Co.
53	Lenoir.....	7.234	H S	246,838.20	7- 6-20	T. H. Gill & Company—West Construction Co.
58	Johnston.....	6.018	G	69,453.50	5-20-20	P. R. Ashby
60	Lenoir.....	7.88	H S	259,445.25	12-23-19	T. H. Gill & Company—West Construction Co.
61	New Hanover.....	2.186	G	188,132.64	7-12-20	C. W. Lacy
65	Pitt.....	9.57	G	99,181.06	11-26-20	Porter & Peck
66	Haywood.....	6.18	G	105,296.45	9-15-20	O'Brien Construction Co.
68	Sampson-Harnett.....	27.4	G	305,225.54	7-23-20	P. R. Ashby—F. L. Grant, Inc.
69	Transylvania.....	9.348	G	231,409.04	3-25-20	Allport & Alexander Construction Company
70A	Jackson.....	4.83	G	150,081.11	6-18-20	Wright & Nave
73	Nash.....	8.73	G	159,913.16	1-20-21	Porter & Boyd
75	Columbus.....	7.06	G	66,605.38	12- 9-20	County Commissioners
86A	Martin-Bertie.....	3.09	G	98,454.67	2-25-20	State Forces (Road)
86B	Martin-Bertie.....	.....	Bridges	332,308.83	3-19-21	Boyle-Robertson Construction Co.
90	Pamlico.....	12.03	G	127,981.78	1- 2-21	Eagle Engineering Company
93	Franklin-Warren.....	19.8	G	192,993.57	9-25-20	Chandler & Ragland—Stearns Bros.
94A	Mitchell.....	5.04	H S	190,375.13	6-22-20	Gibson Construction Company
96	Yancey.....	2.95	G	82,653.12	1- 3-21	Gibson Construction Company
98A	Moore.....	20.53	G	259,240.38	9-10-20	J. T. Plott—J. E. Lane & Co.
98B	Moore.....	8.75	G	41,055.46	6- 6-21	Lee J. Smith Construction Co.
99B	Chatham.....	21.82	G	259,931.59	11-19-20	J. T. Plott—Atlantic Bridge Co. (Bridges)
101B	Randolph.....	9.64	G	107,928.75	11- 5-20	J. T. Plott—Hanford Bros. (Bridges).
103	Duplin.....	11.32	G	111,931.05	6-10-20	County Commissioners
116	Stanley-Montgom'	.....	Bridge	199,614.80	11- 3-21	Cornell-Young Company
117	Wilson.....	6.25	G	41,828.93	3- 8-21	County Commissioners—Lee J. Smith (Bridges)
120	Bladen.....	23.67	G	105,688.55	2-16-21	J. A. Marrow—P. R. Ashby (Bridges)
121	Stokes.....	11.60	G	108,519.62	3- 1-21	Jameson Bros.—Rogers & Shumway (Bridges)
125A	Alleghany.....	4.99	G	153,899.13	11-22-21	W. E. Graham
127	Wilson.....	7.63	G	33,780.45	3- 5-21	County Commissioners—Lee J. Smith (Bridges)
136	Davie.....	6.99	G	61,733.04	2-14-21	Chandler & Ragland—Hagedorn Const. Co. (Bridges)

Projects Completed

NO.	COUNTY	LENGTH	TYPE	APPROXIMATECOST	COMPLETED	CONTRACTOR
1*	Mecklenburg.....	.....	Bridge	\$ 59,224.90	9- 5-18	C. W. Requarth & Company
2*	Henderson.....	7.75	G	33,141.74	12-17-19	State Convict Labor
3*	McDowell.....	2.85	G	24,405.73	12-17-19	County Commissioners
5*	Burke.....	8.03	G	19,888.05	11- 1-19	County Commissioners
8*	Cumberland.....	13.46	G	62,800.71	6-20-21	County Commissioners
9*	Polk.....	12.78	G	68,175.45	4-15-21	County Commissioners
11*	Lenoir.....	1.78	H S	56,893.18	1-25-21	West Construction Company
12*	Wayne.....	8.62	G	26,727.98	11- 2-20	County Commissioners
14*	Halifax.....	8.01	G	19,017.83	8-20-19	State Convict Labor
18*	Alexander.....	9.8	G	66,446.49	3-31-21	County Commissioners
19*	Rockingham.....	8.21	G	32,759.36	11-11-19	County Commissioners
20*	Yadkin.....	6.41	G	25,146.45	7-26-20	County Commissioners
21*	Person.....	7.675	G	25,911.04	3-15-20	County Commissioners
22A*	Alamance.....	1.196	H S	30,103.48	6-27-19	County Commissioners
22B*	Alamance.....	8.3	H S	290,179.36	8-19-21	Powell Paving and Construction Company
23*	Burke.....	7.68	G	42,873.90	11- 1-20	Lovelady Township Forces
24*	Wake.....	4.24	H S	127,840.21	11-30-19	W. W. Boxley & Company
25*	Person.....	8.175	G	101,537.51	10-20-20	County Commissioners
26*	Davidson.....	8.41	G	14,115.96	10- 1-19	County Commissioners
27A	Orange.....	8.235	G	53,945.73	4-23-21	W. S. & L. A. Crawford
29*	Union.....	8.655	G	58,949.25	4- 8-21	County Commissioners—J. S. Stearns
30	Mecklenburg.....	6.304	H S	102,551.35	3-31-21	County Commissioners
31*	Buncombe.....	3.1	H S	70,174.88	10-24-19	County Commissioners
33	Montgomery.....	3.72	G	15,246.71	6- 8-21	County Commissioners
34	Wayne.....	.....	Bridge	50,798.00	10- 8-21	Roanoke Bridge and Iron Works, Inc.
35*	Forsyth.....	1.87	H S	59,867.61	2-25-20	County Commissioners
36*	Durham.....	3.46	H S	115,075.57	12-15-19	R. G. Lassiter & Company
37	Gaston.....	10.38	H S	167,173.23	12-23-21	County Commissioners
38*	Rockingham.....	10.92	G	46,809.92	9-17-20	County Commissioners
38A	Caswell.....	6.67	G	50,907.23	7- 6-21	Bolton Construction Co.
39	Union.....	10.61	G	74,337.71	4- 9-21	County Commissioners—J. S. Stearns
40*	Union.....	4.287	G	18,434.20	12-11-20	County Commissioners
41	Watauga.....	8.95	G	94,681.29	11-10-21	County Commissioners
42*	Stanly.....	11.67	G	80,922.15	9-10-20	Gibson Construction Company
43*	Beaufort.....	2.2	H S	95,089.12	5-11-20	Simmons Construction Company
44*	Granville.....	4.57	G	51,377.43	4-20-21	T. W. Chandler—P. R. Ashby
45	Buncombe.....	7.852	H S	359,777.28	7-23-21	H. A. Wells-Asheville Const. Co.—Asheville Paving Company
47*	Guilford.....	4.607	H S	162,689.83	4- 8-21	County Commissioners

(Continued on next page)

STATUS OF FEDERAL AID WORK IN NORTH CAROLINA--Continued

Projects Completed (Continued)

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	COMPLETED	CONTRACTOR
48A*	Northampton.....	5.804	G	\$ 60,620.51	10-30-20	Virginia Contracting Company
48B	Northampton.....	2.69	G	44,749.65	10- 4-20	Porter & Peck—A. C. House
50*	Guilford.....	2.65	H S	101,596.44	12-31-20	County Commissioners
51	Guilford.....	2.26	H S	87,603.12	9-27-20	County Commissioners
52	Cabarrus.....	8.986	G	162,399.61	3-22-21	Gibson Construction Co.—J. E. Lane
54*	Wake.....	6.811	H S	239,736.26	8-23-20	R. G. Lassiter & Company
55A*	Mecklenburg.....	6.008	H S	196,899.73	12-28-20	Simmons Construction Company, Inc.
55B	Mecklenburg.....	4.59	H S	188,445.18	8-13-21	Simmons Construction Co., Inc.
56*	Forsyth.....	5.868	G	47,709.31	10-29-20	C. H. Hester-Luten Bridge Company
57	Rowan.....	6.75	G	72,549.27	4-22-21	W. E. Graham—R. M. Hudson Company
59	Columbus.....	11.025	G	106,872.26	12- -21	County Commissioners
62	Buncombe.....	3.43	H S	139,191.32	11- -21	H. C. McCrary, Inc.—Asheville Construction Co.
63	Buncombe.....	3.76	H S	167,933.55	9-20-21	Allport & Alexander Construction Co.—H. C. McCrary, Inc.—Asheville Paving Company
67*	Nash.....	8.81	H S	384,126.08	4-20-21	R. G. Lassiter—Atlantic Bridge Company
71	Durham.....	6.69	H S	319,153.39	10-23-21	State Forces
72*	Anson.....	3.896	G	70,470.89	3- 4-21	Gibson Construction Co.—J. A. Kreis & Co.
74A*	Stanly.....	2.803	G	25,537.45	8-20-20	County Commissioners
74B	Stanly.....	4.92	G	63,411.26	5- -21	County Commissioners
76*	Cabarrus.....	1.35	H S	54,583.76	10-29-20	R. M. Hudson & Company
77	Rutherford.....	2.206	H S	100,159.44	9- 5-21	E. T. Belote
78A	Rutherford.....	9.64	G	88,230.71	8- 3-21	Ross Brothers.
78B	Rutherford.....	10.26	G	71,056.48	8- 3-21	Ralph E. Oliver
79*	Cleveland.....	1.645	H S	67,063.64	10-30-20	Noll Construction Company
80A	Montgomery.....	16.6	G	226,516.20	6-20-21	County Commissioners
80B	Montgomery.....	11.07	G	65,145.02	10-25-21	Lee J. Smith Const. Co.—P. R. Ashby
81	Pender.....	26.11	G	273,439.45	12- -21	Porter & Boyd
82	Davidson.....	4.54	G	59,983.71	12-18-20	Heilig & Sherrill
84A	Burke-McDowell.....	8.33	G	128,193.76	8- 3-21	J. A. Kreis & Company
84B	McDowell.....	6.76	G	109,659.49	8- 1-21	J. A. Kreis & Company
85*	Davie.....	8.28	G	58,756.89	9-26-20	W. E. Graham
91	Surry.....	10.68	G	113,805.84	6-27-21	W. E. Graham—R. W. Curtis & Co.
92	Surry.....	10.83	G	133,141.03	6-20-21	W. E. Graham—R. W. Curtis & Co.
98C	Lee.....	4.53	G	18,240.64	10-29-21	Gibson Construction Co.
99A	Chatham.....	12.65	G	126,717.70	8-11-21	T. W. Chandler—State Forces (Bridges)
00	Avery.....	14.00	H S	272,089.78	11- -21	Southern Dray Company
101A	Randolph.....	10.04	G	123,893.99	8-12-21	S. L. Davis—J. A. Kreis & Co. (Bridges)
105	Hoke.....	9.8	G	95,501.80	10-25-21	Jameson Brothers—George, Hankins & George
107	Madison.....	2.46	G	70,910.40	10- -21	Southern Dray Company
109	Burke.....	3.58	G	55,191.64	5-21-21	C. E. Teague
111	Forsyth.....	12.22	G	94,447.10	8-17-21	C. B. Hester—Heilig & Sherrill
112	Caswell.....	11.93	G	147,065.71	11- 2-21	J. M. Gregory—J. E. Lane & Co. (Bridges).
114*	Rowan.....	2.543	H S	83,587.02	3-17-21	R. M. Hudson & Company
129	Richmond.....	17.28	G	77,507.48	12- -21	Mulligan & Roach

*Final Settlement Made With Federal Government

STATUS OF STATE AID WORK IN NORTH CAROLINA

Projects Under Construction

"H S" denotes any type hard surfaced road.

"G" denotes any type of gravel, sand clay, or topsoil road.

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	BEGUN	CONTRACTOR
100	Beaufort.....	10.50	H S	\$ 369,777.70	8-23-21	W. T. Hadlow.
137	Halifax.....	5.67	H S	124,736.97	10-31-21	O. F. Leighton—A. C. House
139	Halifax.....		Bridge.	18,436.66	10-11-21	Chandler & Ragland—Porter & Peck.
151	Hyde.....	4.30	G	71,422.78	12-10-21	C. W. Lacy—Porter & Peck.
160	Franklin-Wake- Nash.....	9.83	G	53,722.95	12- 7-21	Chandler & Ragland—Southern Dray Co.
175	Pasquotank.....	9.50	H S	217,405.72	4- 6-21	County Commissioners.
186	Pitt.....	9.57	H S	260,816.60	9-20-21	Cheatwood & Driscoll.
209	Craven.....	2.65	H S	115,688.21	8-00-21	Eagle Engineering Co.
218	Wayne-Duplin.....	16.06	G	80,804.50	8- 4-21	C. W. Lacy
280	Wayne.....	10.01	H S	311,352.36	11-28-21	Union Paving Company
281	Wayne.....		Bridge	22,484.88		P. R. Ashby
301	Bladen.....	13.17	G	82,028.21	11-12-21	J. F. Mulligan-Powell Paving & Cont. Co.
325	Columbus.....	11.22	G	105,258.23	11- 3-21	J. A. Kreis-Cornell-Young Co.
338	Cumberland-Samp- son.....		Bridge	26,233.99	10-28-21	Roanoke Bridge & Iron Works.
339	Harnett-Cumb l'nd.....		Bridge	16,524.75	11-30-21	Porter & Boyd
375	Pender.....	15.56	G	72,522.92	11- 1-21	A. W. McClay.
376	Pender.....	7.64	G	94,757.85	11-11-21	C. G. Kershaw Const. Co.—Cornell Young Co.
388	Robeson.....	3.35	H S	137,009.40	11-10-21	C. W. Lacy—Roanoke Bridg & Iron Works.
389	Roberson-Colum.....	1.56	G	83,463.38	10-26-21	L. A. Chitwood.
411	Durham.....	5.81	H S	211,574.92	9- 1-21	Hutton Eng. & Const. Co.
427	Granville.....	5.12	H S	159,097.62	12- 1-21	R. G. Lassiter & Co.
436	Harnett.....	21.19	G	144,318.14	6-28-21	C. G. Kershaw Const. Co.—Hobbs & Kitchen.
454	Orange.....	4.29	H S	192,006.15	6-18-21	Elliott, Sholes & Tee r

(Continued on next page)

STATUS OF STATE AID WORK IN NORTH CAROLINA--Continued

Projects Under Construction (Continued)

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	BEGUN	CONTRACTOR
455	Orange	4.19	G	\$ 46,415.77	11-28-21	J. F. Mulligan Const. Co.—P. R. Ashby.
482	Wake	6.64	H S	191,669.21	12- 8-21	R. M. Hudson Company.
500	Alamance	5.22	G	32,732.20	8- 4-21	W. W. Tuck & Son—A. M. Hazell, Connerate—Quist Const. Co
501	Alamance	13.10	G	32,627.10	12- 7-21	W. M. Shook—Hanford Bros.
511	Caswell	1.48	G	74,192.58	12-12-21	White & Simpson—C. B. Hester.
525	Davidson	10.24	H S	363,141.68	12-23-21	Elliott & Sons & Boggs—Austin Bros. Bridge Co.
533	Guilford-Forsyth	10.59	H S	427,997.62	7-11-21	Royer-Ferguson Const. Co.
630	Gaston	3.02	H S	98,392.36	10-12-21	W. F. McCanless.
638	Iredell	7.88	H S	244,509.30	10-12-21	Thompson-Caldwell Co.
655	Mecklenburg	1.57	H S	62,027.68	12-21-21	Speed-Parker Co., Inc.—Luten Bridge Co.
657	Mecklenburg	13.8	G*	20,000.00	12- 8-21	State Forces.
700	Alleghany	7.90	G	132,297.33	6-23-21	W. E. Graham
701	Alleghany-Wilkes	8.00	G	153,863.60	6-16-21	W. E. Graham
710	Ashe	3.14	H S	142,687.93	9- 8-21	Pittman Const. Co.
722	Caldwell	7.00	G*	12,000.00	8-17-21	County Forces.
750	Stokes	14.86	G	93,054.48	9-15-21	J. F. Mulligan Const. Co.—Lee J. Smith
751	Stokes	7.25	G	31,746.00	10- 4-21	W. E. Graham
780	Wilkes	18.00	G*	25,000.00	7-25-21	J. F. Mulligan.
781	Wilkes	14.50	G*	30,000.00	7-25-21	J. F. Mulligan.
783	Wilkes-Watauga	34.40	G*	80,000.00	9- 2-21	Chandler & Ragland.
844	McDowell	1.80	H S	57,048.42	5-12-21	Bolton Construction Co.
845	McDowell	7.19	G	132,177.93	9- 6-21	J. W. Stapp Const. Co.—Praytor, Howton, Wood Const. Co.
846	McDowell	10.06	G	204,680.74	9-12-21	Asheville Const. Co.—W. T. Taylor Const. Co.
855	Mitchell	4.97	H S	174,393.78	9-12-21	Fiske-Carter Construction Co.
877	Rutherford	9.79	G	64,563.73	5-31-21	Geer & Wilson
878	Rutherford	6.55	G	50,913.50	9-22-21	Michaux Const. Co.—Geer & Wilson.
910	Cherokee	7.56	G	76,743.59	5-24-21	Ross Bros.—W. T. Moore Conc. Prod. Co.
911	Cherokee	10.33	G	84,475.38	10-25-21	H. A. Wells—Southern Dray Co.
921	Clay	12.37	G	123,929.52	10-24-21	Lee J. Smith Const. Co.—W. T. Moore Conc. Prod. Co.
930	Graham	12.90	G	130,522.00	10-15-21	Lee J. Smith Const. Co., C. M. Dicus.
942	Haywood	0.57	G	5,294.46	7-12-21	O'Brien Construction Co.
950	Jackson	7.56	G	145,313.30	6-13-21	Wright & Nave—O'Brien Const. Co.
960	Macon	4.97	G	69,100.57	6- 6-21	J. T. Plott—J. E. Lane & Co.
961	Macon	4.77	G	58,340.59	12- 5-21	J. T. Plott—J. E. Lane & Co.
970	Madison-Yancey	13.80	G	267,378.26	10-11-21	R. H. Wright & Sons—O'Brien Const. Co.

Projects Completed

692	Union	2.28	H S	65,366.67	12-28-21	Redmon Construction Co.
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*Reconstruction only.

Projects Under Contract

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	CONTRACTOR
113	Chowan	10.32	G	40,759.73	Nello L. Teer—P. R. Ashby.
114	Chowan	10.00	G	45,064.09	Battershill & Goode—Chandler & Ragland.
155	Martin-Pitt	20.00	G	98,176.65	J. P. Dicus—P. R. Ashby.
159	Nash	11.22	G	89,942.43	J. A. Kreis & Co.
191	Tyrell	6.91	G	57,934.41	C. W. Lacy—M. M. Jones.
211	Craven	9.93	H S	262,673.20	Union Paving Company.
227	Greene	6.81	H S	238,113.70	West Const. Co.—Union Paving Co.
263	Pamlico	12.03	H S	289,324.20	Union Paving Company.
291	Wilson	7.63	H S	203,493.18	P. R. Ashby.
409	Durham	0.5	H S	6,140.64	J. P. Dicus.
410	Durham	2.3	H S	83,921.97	C. D. Riggsbee.
456	Orange	9.00	G	37,459.07	Crawford & Crawford—Nello Teer.
481	Wake	7.20	H S	252,925.15	Union Paving Co.—P. R. Ashby.
483	Wake	0.54	H S	19,989.75	C. D. Riggsbee.
504	Alamance	5.22	H S	154,127.16	Elliott-Sholes Company.
532	Guilford	11.70	H S	387,499.20	Elliott-Sholes Company.
622	Catawba	10.85	H S	354,684.88	Union Paving Company.
632	Gaston	9.5	H S	291,868.94	Davis-Wilcox Const. Co.
639	Iredell	10.59	H S	387,448.42	R. M. Hudson Co.—Luten Bridge Co.
653	Mecklenburg	8.84	H S	308,182.44	Union Paving Co.—Luten Bridge Co.
695	Union	4.3	H S	123,865.28	Redmon Const. Co.
811	Burke	6.0	H S	189,412.41	Southern Dray Company.
823	Cleveland	2.0	H S	81,234.01	Southern Paving Co.—Z. B. Weathers & Son.
833	Henderson	15.90	G	38,412.44	S. L. Davis Const. Co.—Asheville Const. Co.
856	Mitchell	4.0	H S	239,005.80	Porter & Boyd—L. J. Chandler & Co.
879	Rutherford	.....	Bridge	5,737.38	Austin Bros. Bridge Co.
920	Clay	4.8	G	54,875.81	E. A. Wilson & Co.—W. T. Moore Conc. Prod. Co.
980	Macon-Swain	17.9	G	344,161.29	E. A. Wilson & Co.—Southern Dray Co.

(Continued on next page)

STATUS OF STATE AID WORK IN NORTH CAROLINA--Continued

Summary

	NUMBER OF PROJECTS			MILEAGE		APPROXIMATE TOTAL COST		
	H S	G	BRIDGE	H S	G	H S	G	BRIDGE
UNDER CONSTRUCTION								
Federal Aid Projects.....	5	28	2	30.38	284.47	\$ 901,972.52	\$3,451,565.56	\$ 531,923.63
State Aid Projects.....	19	35	4	116.32	371.97	3,861,333.63	2,965,661.59	83,680.28
Total Under Construction....	24	63	6	146.70	656.44	4,763,306.15	6,417,227.15	615,603.91
UNDER CONTRACT								
Construction not yet begun								
Federal Aid Projects.....								
State Aid Projects.....	19	9	1	118.94	106.05	3,837,910.33	806,785.92	5,737.38
Total Under Contract.....	19	9	1	118.94	106.05	3,837,910.33	806,785.92	5,737.38
COMPLETED								
Federal Aid Projects.....	26	53	2	122.05	456.51	4,039,583.81	3,900,285.07	110,022.90
State Aid Projects.....	1			2.28		65,366.67		
Total Completed.....	27	53	2	124.33	456.51	4,104,950.48	3,900,285.07	110,022.90

Total mileage of Hard Surface work under construction or contracted for..... 265.64
 Total mileage of Topsoil, Sand Clay or Gravel work under construction or contracted for..... 762.49

Total mileage under construction or contracted for..... 1,028.13

Total cost of Hard Surface work under construction or contracted for..... \$ 8,637,216.48
 Total cost of Topsoil, Sand Clay or Gravel work under construction or contracted for..... 7,224,013.07
 Total cost of Bridge work under construction or contracted for..... 621,341.29

Grand Total cost of work under construction or contracted for..... \$ 16,482,570.84

Total mileage of Hard Surface work completed..... 124.33
 Total mileage of Topsoil, Sand Clay or Gravel work completed..... 456.51

Total mileage of work completed..... 580.84

Total cost of Hard Surface work completed..... \$ 4,104,950.48
 Total cost of Topsoil, Sand Clay, or Gravel work completed..... 3,900,285.07
 Total cost of Bridge work completed..... 110,022.90

Grand Total of all work completed..... \$ 8,115,258.45

Corrected to January 1, 1922.

**FIDELITY & DEPOSIT CO.
OF MARYLAND
STANDARD ACCIDENT
INSURANCE COMPANY**

insuring you prompt service and sympathetic treatment.

We desire to announce our splendid facilities for taking care of your bonds and liability insurance. We can make arrangements to write your contract bonds on the spot,

McPHERSON & BARNES

General Agents for North Carolina

Rooms 403-405 Commercial National Bank Building
RALEIGH, N. C.

**PITTSBURGH
TESTING
LABORATORY**

Inspecting Engineers and Chemists

Testing and inspection highway materials and construction, bituminous materials, cement, concrete aggregates, brick, reinforcing steel, structural steel, creosoted timber, inspected and tested at point of manufacture prior to shipment. Plant inspection bituminous pavements.

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*MANUFACTURER AND
DEALER*

**IRON AND STEEL FOR
BUILDINGS**

*Iron Stairs
Fire Escapes
Metal Windows and Doors
Steel Sash
Steel Rolling Doors
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Window Guards*

Fireproofing Specialties

**CONTRACTORS'
EQUIPMENT**

*Concrete Mixers
Saw Rigs
Derricks*

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GREENSBORO, N. C.

ATLANTIC BRIDGE COMPANY

*Engineers and Contractors
Steel and Concrete Bridges*

General Offices:
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STEEL BUILDING MATERIALS

FOR

BRIDGES *and* BUILDINGS

Immediate Shipments
**CONCRETE
REINFORCING BARS**

FROM OUR

Charlotte Warehouse

National Steel Lumber
Lupton Steel Windows
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Coal Chutes
Ornamental Iron Work

**SOUTHERN
ENGINEERING
COMPANY**

CHARLOTTE, N. C.

=====
*Write for complete information
and estimates*

A RUSSELL ROAD MACHINE FOR EVERY NEED

Before deciding upon a road machine let us assist you by suggesting what we consider best for your requirements. We make this offer because we know that this is one of your problems. The first thing to decide upon is whether you want a machine for construction or maintenance; for horse power or tractor power.

For Construction buy the largest machine for which power is available. The *Russell Mogul* with a 12-foot blade and a 25-horse power tractor will construct your roads most economically.

The *Russell Reliance*, with a 10-foot blade, ranks next to the Mogul. With this machine we suggest at least a 20-horse power tractor.

The *Russell Special* is a combination machine for which you may use a 15-horse power tractor or 8 or 12 horses. It is equipped with an 8-foot blade and is often preferable over the Standard for use with animal power in stony or stumpy soil.

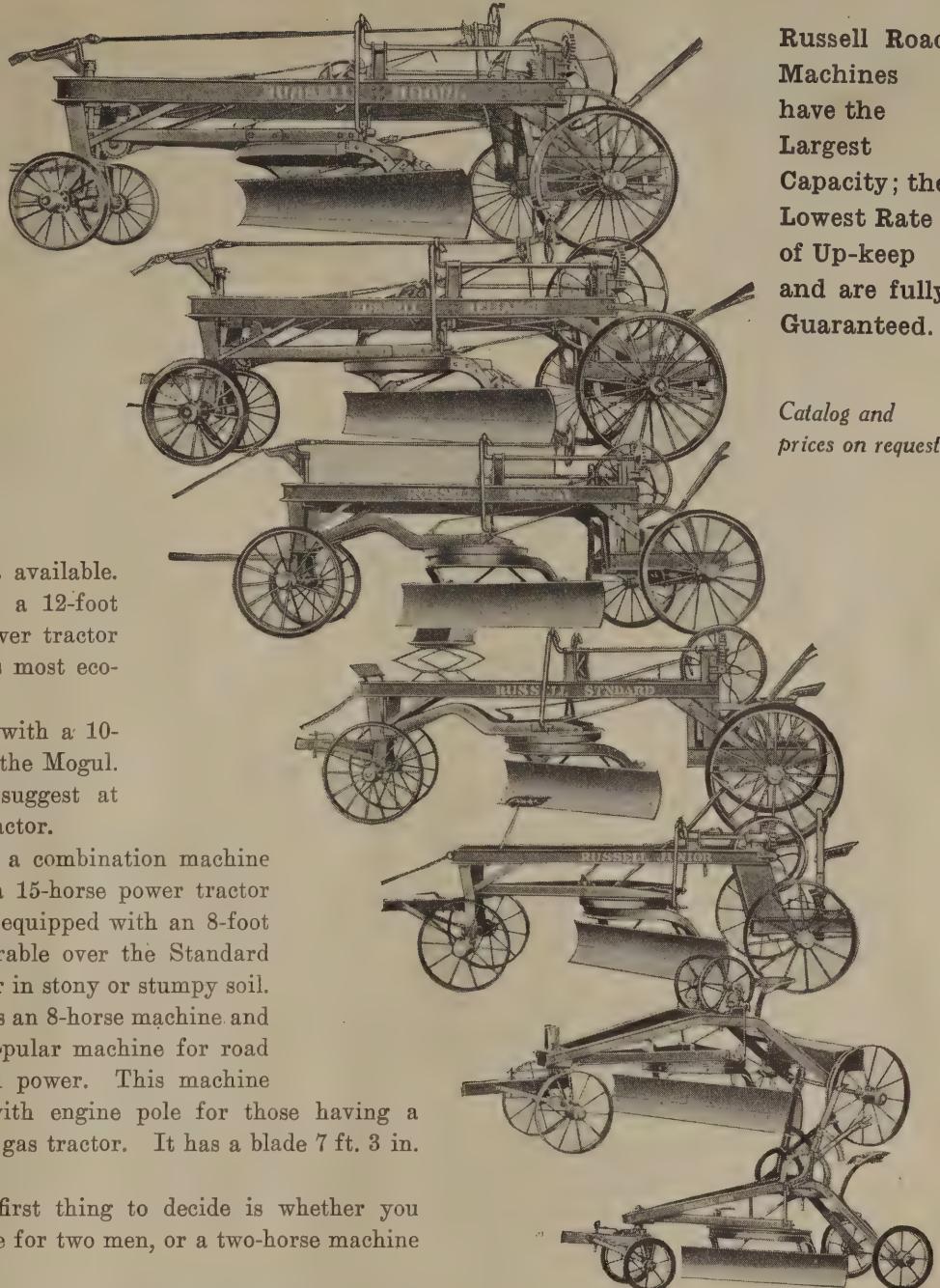
The *Russell Standard* is an 8-horse machine and is, no doubt, the most popular machine for road construction with animal power. This machine may also be equipped with engine pole for those having a small 8 to 15-horse power gas tractor. It has a blade 7 ft. 3 in. long.

For Maintenance the first thing to decide is whether you want a four-horse machine for two men, or a two-horse machine for one man.

For those who are willing to put four horses and two men on the grader, the *Russell Junior* will do maintaining work more effectively than any other grader. This machine has a 6-foot blade and may be used for light road construction as well as maintenance.

The *Russell Hi-Way Patrol* grader is built especially for greatest efficiency in patrol and maintenance work with two horses and one man. It is lighter than the Junior and is equipped with a 6-foot blade. Blade is operated by worm and gear lift, giving the finest kind of adjustment.

The *Russell Gem* is the cheapest of the high-framed type machines. It is equipped with 5-foot, one-piece, reversible blade. The blade is operated by lever. It is a one-man, two-horse machine.



Russell Road Machines have the Largest Capacity; the Lowest Rate of Up-keep and are fully Guaranteed.

Catalog and prices on request.

E. F. CRAVEN, "THE ROAD MACHINERY MAN"
STATE DISTRIBUTOR GREENSBORO, NORTH CAROLINA
COMPLETE LINE OF MACHINES AND REPAIRS IN STOCK

We are Distributors for Virginia, North and South Carolina for the Following New Equipment:

Air Compressors, Locomotives, Street Cleaning tools and machines, Road pumps, Trench pumps, Steam pumps, Sand pumps, Steam, electric and gasoline hoists, Cranes of all types, Fire apparatus, Asphalt tools, Motor trucks, Trailers, Pavers, Building Mixers, Light mixers, Concrete chute systems—complete, Mortar mixers, Saw rigs, Graders, Asphalt pumps and distributors, Dump bodies, Conveyors, Elevators, Road Graders, Crushers, Scarifiers.

We have a full line of used machinery a great deal of which is owned outright by us and has been fully rebuilt in our own shops in Norfolk.

If you want anything in the way of used machines that must be about as good as new write us.

At this time we have going through our shops, rebuilding, the following:

Ten ton steam roller, Five ton tandem roller, One bag light mixer, 3½ ton Kelly Truck, Monarch Tractor, Three hoisting engines, Two air compressors, Pipe thread-

ing machine, 44 ins. engine lathe, 5 ton Alco Truck, 5 drill presses, No. 3. Keystone shovel, one paving mixer, etc., etc., etc.

We have a full line of slightly used plants on which we can save you money.

Let us have your inquiries.

We have a number of good pieces of plant that we will rent to responsible people.

This will save you buying equipment for the small contracts.

We have to rent now: No. 3 Keystone Hoisting engine D. C. 7 x 10, D. D. with boiler. Ten ton steam roller, Five ton tandem roller, 30 h. p. crawler type tractor, Thew Steam shovel, Two small air compressors with gasoline engines, Air compressor with electric motor, 21-S Mixer with boiler, engine, sideloader and tank, One-bag gasoline mixer loader and tank, 1250 yard Asphalt plant-complete.

All above plant is our own property and fully guaranteed.

Write us for terms.

We can use a few good sub-agents in the larger towns in all three states. If you visit contractors and can sell machinery we can put you in position to make some good extra money.

*Sixteen years in business—our
customers our references*

LEWTER F. HOBBS, INC.
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Offices and show rooms
113-115 East Twelfth St.

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835-837 West 38th. St.



**Permanent
Construction**

Concrete

Minimum Maintenance

Solves the Road Problem

The concrete road is gaining in favor in all parts of the United States. Whether laid in North or South, East or West, in all varieties of climate and under widely varying conditions, the concrete road is meeting with success and is solving the problem of securing a roadway at reasonable cost that will stand up under modern traffic conditions.

Public approval and appreciation of the concrete road is based upon practical observation as to its extreme utility, reasonable first cost and the almost negligible outlay required for maintenance.

The most important question in road building today is that of maintenance. The one aim and desire of road officials and engineers has been to find a material, the use of which would keep maintenance charges at a minimum. In Bellefontaine, Ohio, the maintenance cost of a concrete road put down 20 years ago has averaged only one-fourth of a cent per square yard per year.

In Wayne County, Michigan, the maintenance on 60 miles of concrete road laid 1909 to 1912 was less than one-sixth of a cent per square yard for three years.

Concrete, therefore, completely answers the maintenance question.

And this combined with reasonable first cost makes it the ideal material for a modern road to meet modern conditions.

CLINCHFIELD PORTLAND CEMENT CORP.
Office and Mills: KINGSPORT, TENN.



GOOD MATERIAL
— FOR A —
GOOD ROAD
IS ESSENTIAL

LEHIGH PORTLAND CEMENT

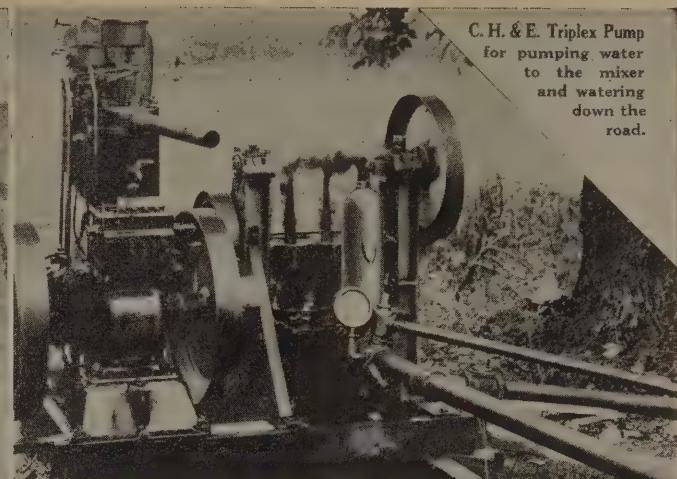
has been used in the construction of
some of the best highways in the
country because of its

Quality and the Service of the

LEHIGH PORTLAND CEMENT COMPANY
ALLENTOWN, PA.
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OFFICES and MILLS
from
COAST to COAST





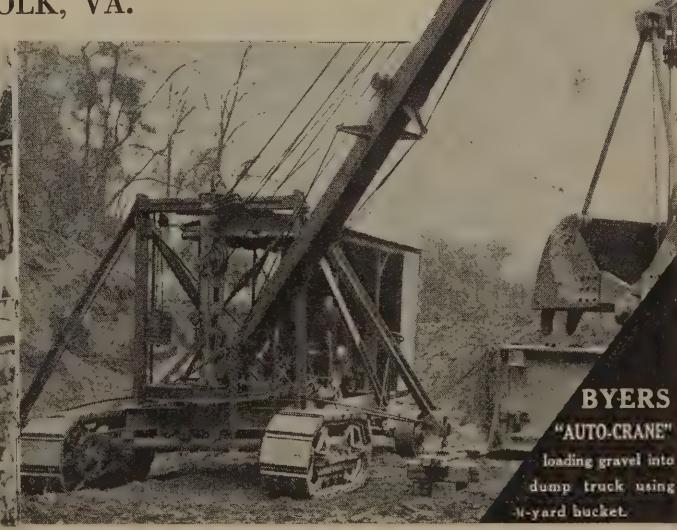
UTILITIES

GENERAL COMPANY

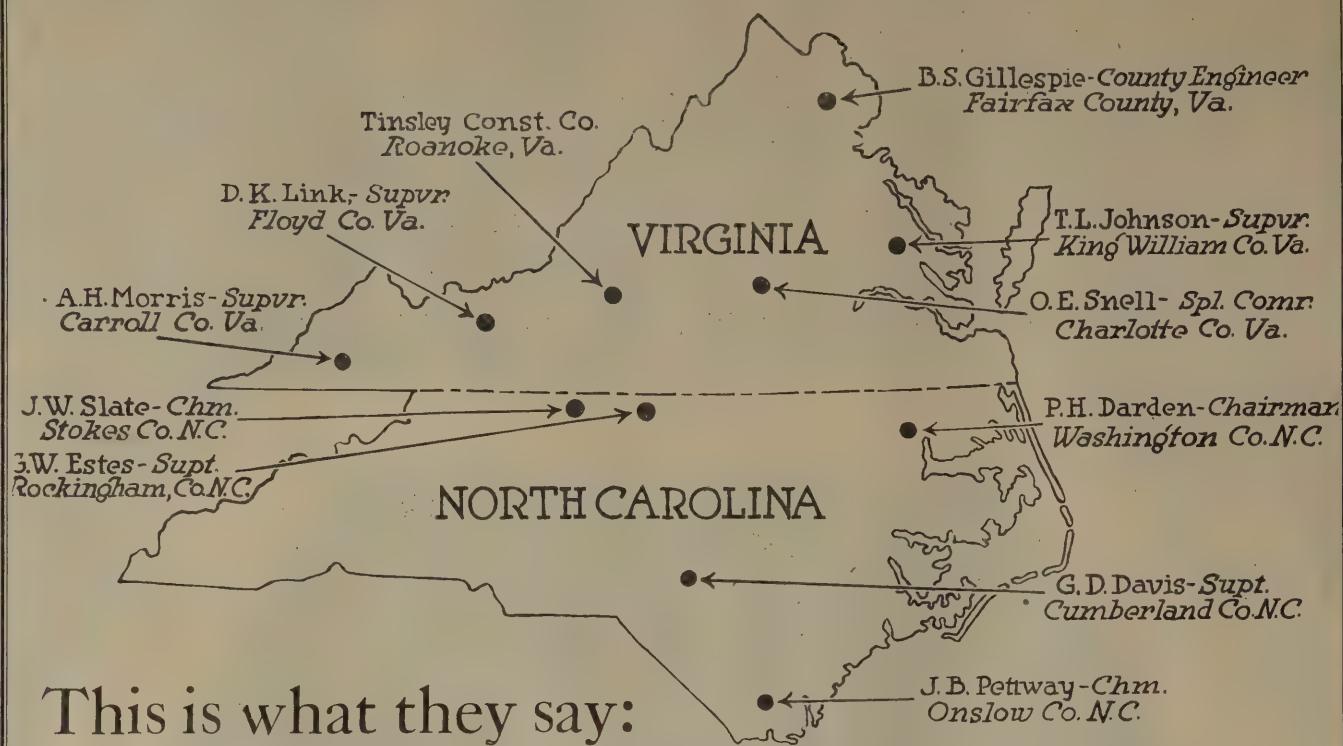
Steam Shovels Mixers Pumps Stone Loaders Hoists Steel Forms Cranes Derricks Gasoline Conveyors Locomotives

This Barber-Greene Loader replaced 13 laborers.
See one with crawler traction on the
Norfolk-Virginia Beach Road.

NORFOLK, VA.



Here's Where they are Located:



This is what they say:

"We believe the HOLT "CATERPILLAR" Tractor to be the best possible method for building and maintaining Roads."

We believe the HOLT "CATERPILLAR" Tractor to be the cheapest possible method for building and maintaining Roads."

We believe the HOLT "CATERPILLAR" Tractor will give the best possible satisfaction in building and maintaining Roads."

There's lots of "history" connected with this:

Fairfax County bought their first "five" sometime ago and have added a "ten."

After the first purchase additional "CATERPILLARS" have been added by Charlotte and Floyd Counties, Virginia, and Washington, Cumberland and Rockingham Counties, North Carolina.

This tells the whole story!

THERE'S BUT ONE "CATERPILLAR" **HOLT BUILDS IT**

Have you placed an order for yours? If not communicate with

TRACTOR & MACHINERY SALES COMPANY
1631 WEST BROAD STREET, RICHMOND, VA.

DISTRIBUTORS

THE AUSTIN-WESTERN ROAD MACHINERY CO.
THE HOLT MANUFACTURING COMPANY
BAKER-MANEY WHEELER



Fort Fisher Highway, New Hanover Co., N. C. Treated with "Tarvia-B" 1915-17-18-19 and "Tarvia-A" in 1916.



Above is Wrightsville Turnpike, New Hanover Co., N. C. Treated with "Tarvia - A" 1915, and with "Tarvia-B" 1917.

"The Best Investment The Board Ever Made"

Mr. Addison Hewlett, Chairman of the Board of Commissioners of New Hanover County, N. C., writes, under date of July 25, 1921:

"We have been using Tarvia for surface treating the macadam roads of New Hanover County for the past six years, and we find this treatment satisfactory in every respect.

"Before we started the use of Tarvia we had great difficulty in maintaining our roads, as they became very dusty in dry weather and washed away in wet weather, leaving our road surface full of holes and ruts. Since using Tarvia the surface of the roads has been well protected in all kinds of weather, and today our roads have smooth, hard surfaces and our maintenance problem has been very easily solved. The Tarvia treatment is very inexpensive.

"It is unquestionably the best investment the Board of Commissioners has ever made and the Commissioners would not consider for a moment discontinuing Tarvia on our roads."

Write for free illustrated booklet describing the various uses of Tarvia



Another view of Fort Fisher Highway.

Additional comments on Tarvia are made by R. A. Burnett, County Superintendent of Roads:

"Tarvia treatments are given to some of our roads every year while other roads, such as the Wrightsville Turnpike, have lasted as long as three years before requiring another treatment.

"These treatments have cost us in the neighborhood of \$300 per mile per year and have proved to be the best, easiest and cheapest method of maintaining our roads. We have always had the best of co-operation from your engineers . . .

"We feel that we have a finer system of roads than any other county in the State."

No matter what your road problems may be—new construction, maintenance, or repairs—there is a grade of Tarvia made especially for the purpose.

Tarvia
*For Road Construction
Repair and Maintenance*

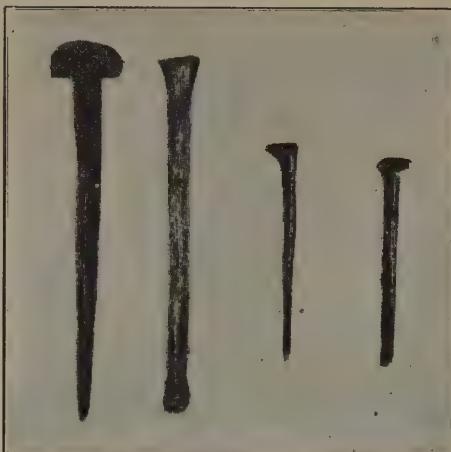
36th and Grey's Ferry Avenue

The *Barrett* Company

Branches in All Leading Cities

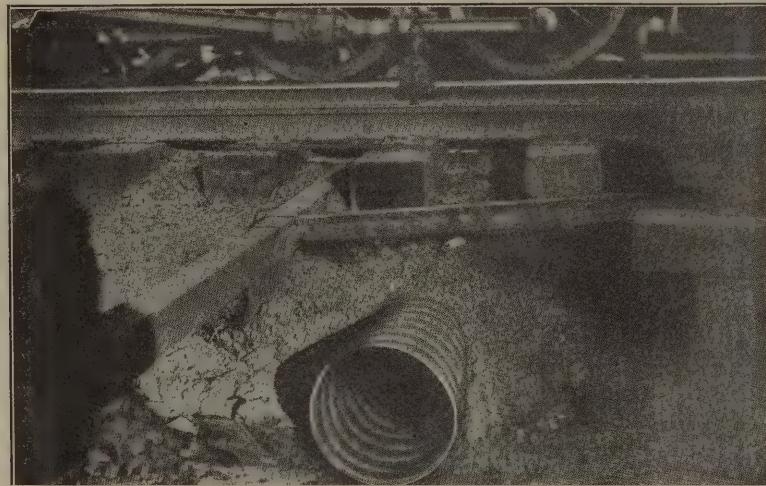


PHILADELPHIA, PA.



PURE IRON LASTS LIKE THIS

Pure iron nails from coffin of soldier buried at Fort St. Clair, Ohio, U.S.A. After being 100 years in the ground, they are practically undamaged by rust. Analysis shows them to be 99.83% pure iron, containing only the merest traces of carbon, copper and sulphur.



The Engineer of the Atlanta Terminal Company says that the Armco Culvert pictured here is in such good condition today that it ought to last several times the ten-year period during which it has already withstood the acid waters which go thru it in the Railroad yards, as well as the pounding of the 450,000 heavy trains which have gone over it.



THE DIXIE CULVERT AND METAL COMPANY

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NORTH STATE CULVERT *and* MACHINERY COMPANY

217 Lewis Street

TELEPHONE 2933

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GENERAL LINE OF ROAD BUILDING
MACHINERY, CONTRACTORS' EQUIP-
MENT AND CULVERTS. A NEW
NORTH STATE FIRM BUT OLD IN
EXPERIENCE IN SUPPLYING WHAT
YOU WANT.

LET US KNOW YOUR WANTS

ROAD *MULTI FOOTE* PAVER

TRADE MARK REGISTERED



Fourth Year of the MultiFoote Paver

Foote perfected and brought out the first road paver with full-length caterpillar type traction in 1919.

Like most notable paving mixer improvements that have been pioneered by Foote, the MultiFoote was an idea developed on the job—in watching and studying the operation of many Foote Pavers built before it.

The **MultiFoote** traction lays its own planking. It saves all delays in moving. It steers by power, turns in its own length. It has less ground pressure than the average walking man and travels easily over the softest sub-grade. Paving contractors were quick to appreciate these important advantages—the **MultiFoote** was an assured success from the start. In less than two years the **MultiFoote** traction almost entirely replaced the old wheel type traction.

For these reasons the Foote plant—undoubtedly the largest factory manufacturing paving mixers exclusively—has for more than two years and will during 1922 be devoted entirely to the production of the two sizes of MultiFoote Pavers.

General Southern Agent

Burton Franklin, Chattanooga, Tenn.

NORTH CAROLINA AGENT

E. F. CRAVEN, "THE ROAD MACHINERY MAN"

GREENSBORO.

Made by THE FOOTE CO. INC., NUNDA, N. Y.



Literature! Literature!! Literature!!!

READ BUILDING LITERATURE

A booklet on each type of asphaltic construction—from the temporary laying of the dust with asphaltic road oil, to the building of permanent asphalt pavements

Do You Wish to Know How to Build Sheet Asphalt, Asphalt Concrete, or Macadam Pavements?

*We have a limited supply of booklets
on the above named subjects*

—The feature of each booklet is this: In each case the work is described step by step in simple, non-technical language from the time the materials are brought to the street, right on through until the roller has finished its work, and the pavement is ready for traffic.

—They are handy little booklets of a convenient size, which permits of their being carried in your pocket while you are superintending your job or traveling about.

—Our Road Oil booklet covers every liquid asphalt product from the dust layer to the material used to surface-treat old macadam and gravel roads. It includes data on how to unload each grade, the quantity applied per square yard, quantity of covering required, if any, and other information which would be helpful in connection with the distribution of road oil and liquid asphalt.

—“*What is Your Highway Problem?*” is the name of a portfolio which contains an outline of each step in the construction of every type of road and pavement in which asphalt is used. This portfolio is illustrated by views showing actual construction, which serve to bring home more clearly the points brought out in the text.

—A card from you need but carry your name, address, and the literature in which you are interested.



THE TEXAS COMPANY

ASPHALT SALES DEPARTMENT



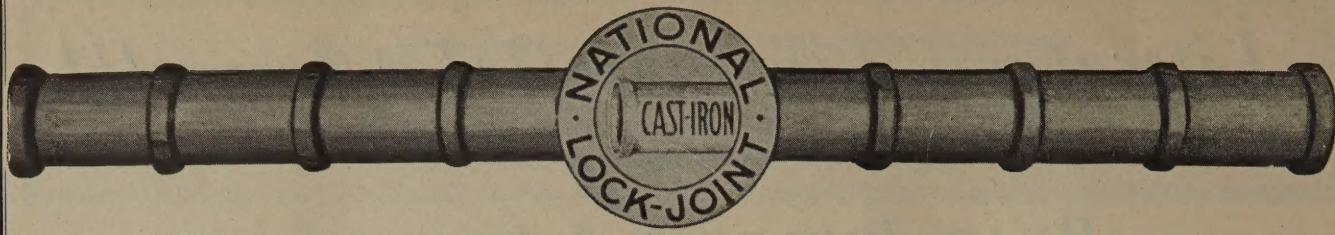
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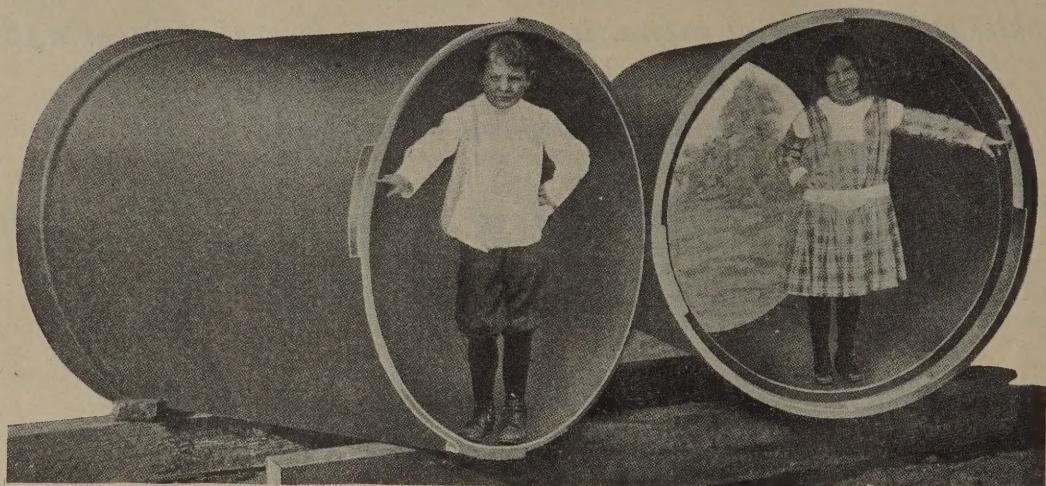
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Houston
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Long Years of Life Ahead of Them



National Lock-Joint Cast-Iron Pipe

The Pipe of Short Units, Long Service and Low Costs

*The Pipe that locks effectively, that prevents Separation
and assures alignment to perfection.*

The pipe which solves culvert renewal problems with least expense, greatest efficiency. The pipe that does not rot or disintegrate, the pipe that is mechanically correct and has proved itself the solution of the culvert problem.

CONTRACTORS and ENGINEERS, GET THIS:

TWO MEN, without the use of any tools whatsoever, will unload, handle and install all sizes up to and including 36 inches in diameter.

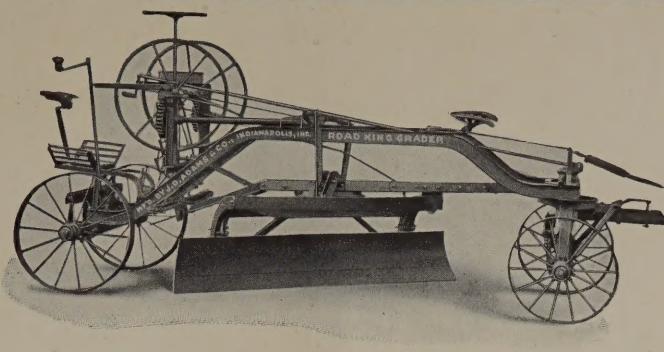
It is as cheap to handle and install as clay pipe WITH NO BREAKAGE LOSS. In shallow trench work the entire culvert can be built up, interlocked and rolled into place in one operation.



AMERICAN
CASTING CO.
Birmingham, - - Alabama
T. B. TURNER & CO.
Raleigh, : : North Carolina



MOST MILES OF GOOD ROADS PER DOLLAR



ROAD KING GRADER, 8-FOOT BLADE

translated into working terms means Adams Road Building and Maintenance Equipment

For your road building grading use

ADAMS ADJUSTABLE LEANING WHEEL GRADERS

that are guaranteed to do more work for you with less power and therefore less cost, than any other graders on the market. The difference is in the leaning wheels—an exclusive feature on Adams Graders.

They are built with blades ranging from 6 ft. to 12 ft. long. There's a size to suit your work that can be furnished either for animal or tractor power.

To keep your roads always smooth and properly crowned, use

ADAMS ROAD MAINTAINER

a flexible machine which shapes both sides and crowns the center of the road in one operation, preserving the original contour of the road. Operated by one man and a truck or light tractor, it covers many miles of road a day, making the maintenance cost per mile very low. Adjustable to all road widths and conditions.

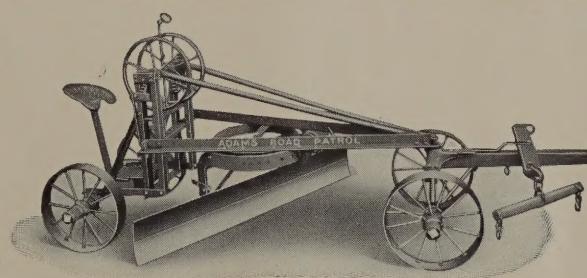
ADAMS ROAD OR PATROL SCRAPER

a mighty popular little one-man, two-horse maintenance machine for maintaining roads by the patrol system. Thousands in use all over the country.

We also manufacture a superior line of Road Drags, Scarifiers, Scrapers, Plows, etc.

J. C. BENJAMIN, RALEIGH, N. C.
BLAND HOTEL

J. D. ADAMS & COMPANY
HOME OFFICE AND FACTORY
INDIANAPOLIS, INDIANA



ADAMS ROAD PATROL SCRAPER

GET IN TOUCH WITH OUR LOCAL REPRESENTATIVE—HE IS THERE TO SERVE YOU

STEEL FABRIC

The Backbone of "National" Highways

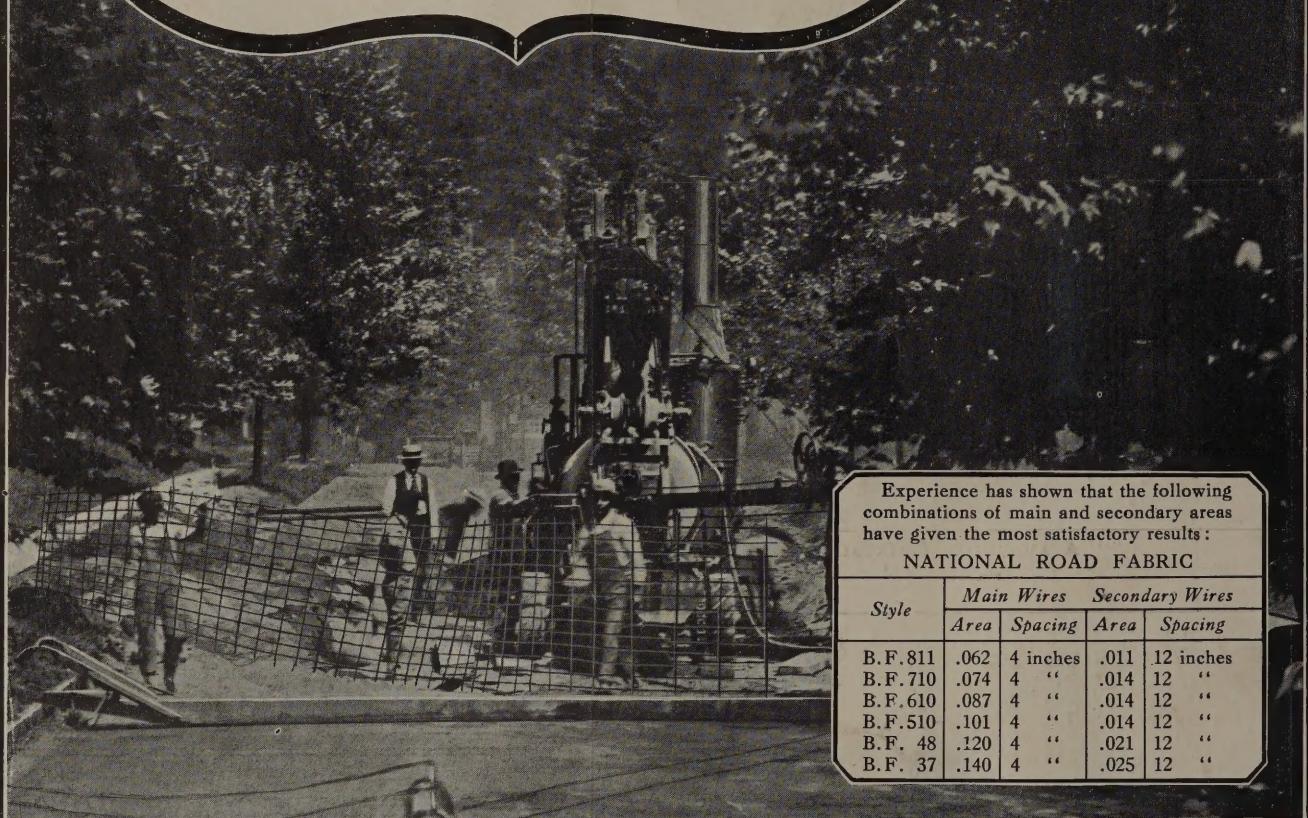
What the backbone is to the human body, National Steel Fabric is to concrete roads—

Strength, Stability and Long Life.

Made from ore to finished product by the world's largest manufacturer of welded fabric—this assures prompt shipment and efficient service at all times.

Write for catalog 714. Samples and prices on request.

"Cooperation Stimulates Service"



Experience has shown that the following combinations of main and secondary areas have given the most satisfactory results:

NATIONAL ROAD FABRIC

Style	Main Wires		Secondary Wires	
	Area	Spacing	Area	Spacing
B.F. 811	.062	4 inches	.011	12 inches
B.F. 710	.074	4 "	.014	12 "
B.F. 610	.087	4 "	.014	12 "
B.F. 510	.101	4 "	.014	12 "
B.F. 48	.120	4 "	.021	12 "
B.F. 37	.140	4 "	.025	12 "

NATIONAL STEEL FABRIC CO

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